# THE JOURNAL OF GAS LIGHTING
## WATER SUPPLY & SANITARY IMPROVEMENT

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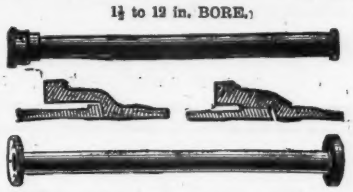

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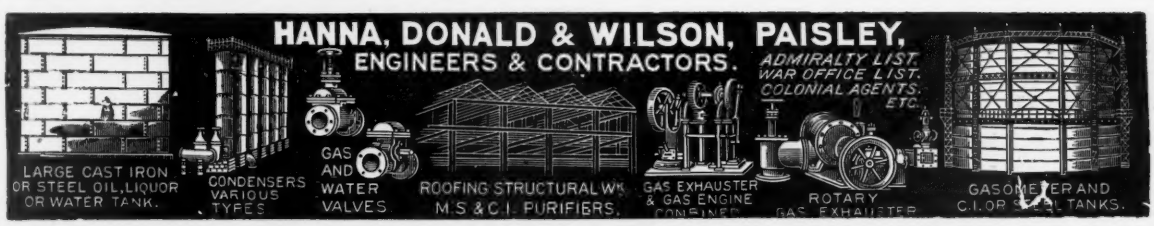
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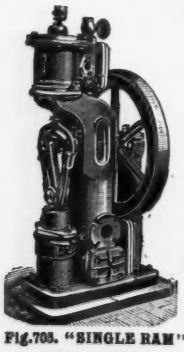

Fig. 703. "SINGLE RAM" STEAM-PUMP.

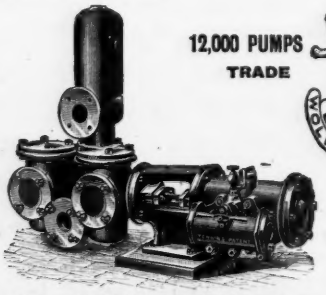

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

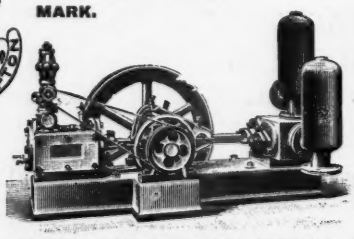

Fig. 685. "RELIABLE" STEAM PUMP FOR TAR AND THICK FLUIDS.

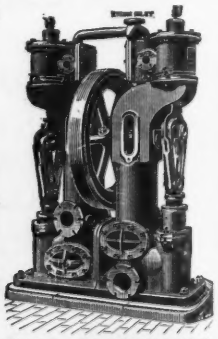

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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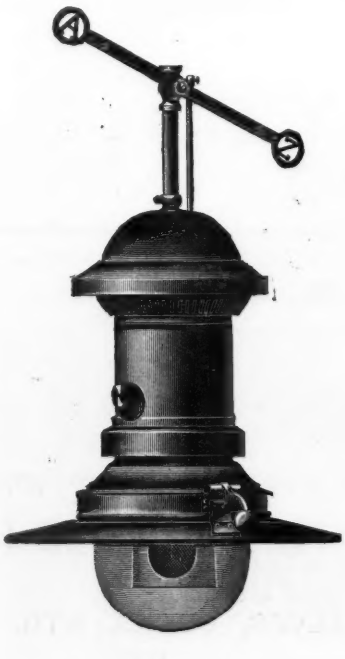

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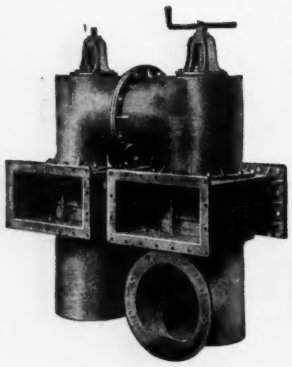

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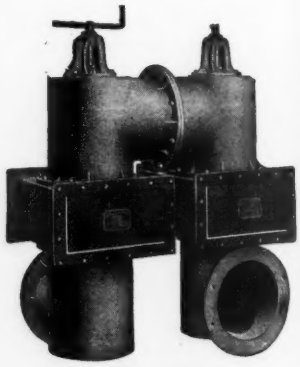

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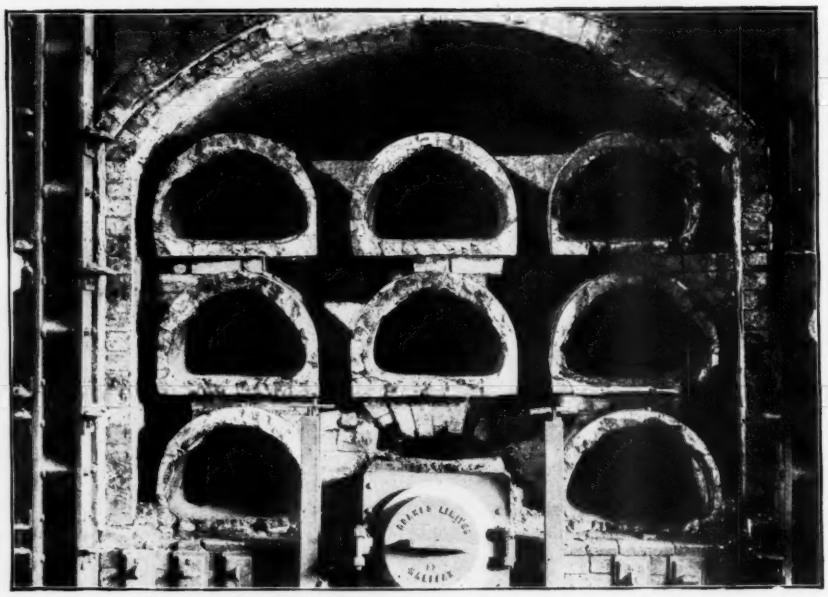

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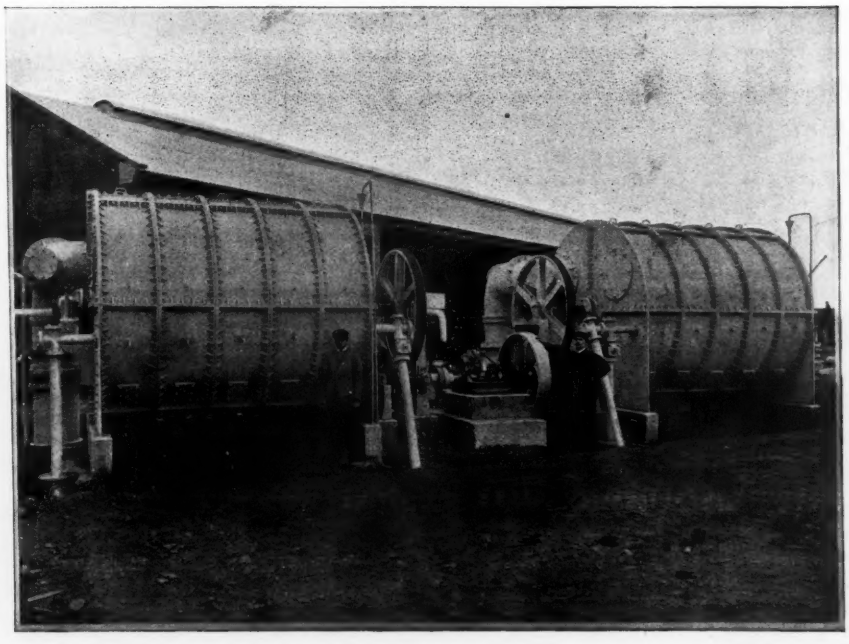

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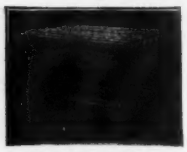

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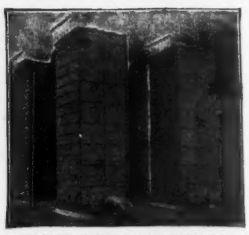

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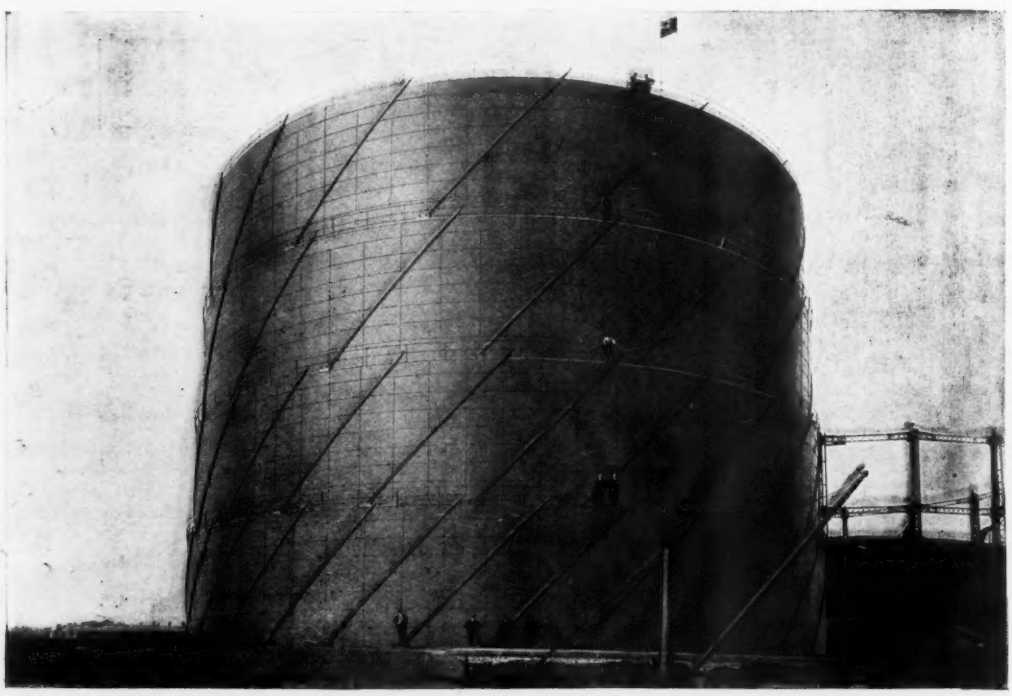

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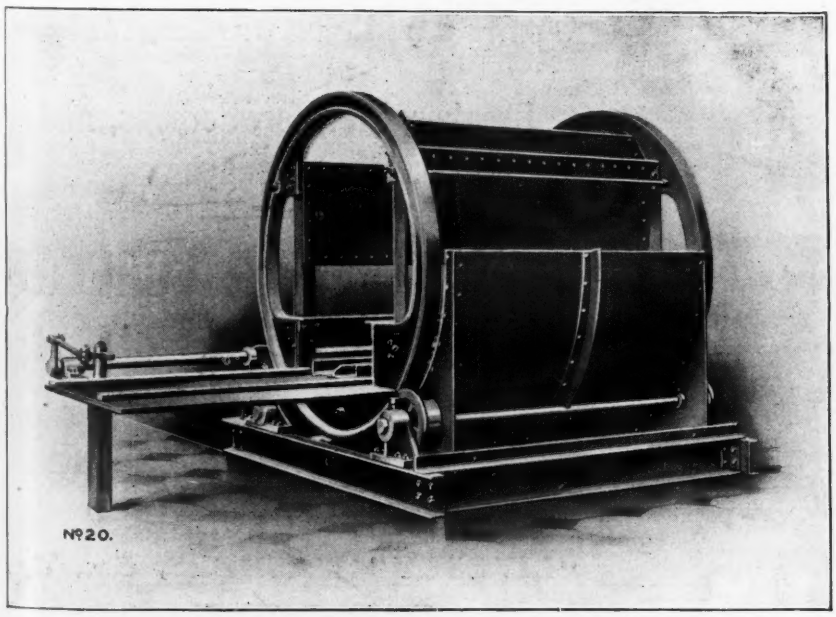


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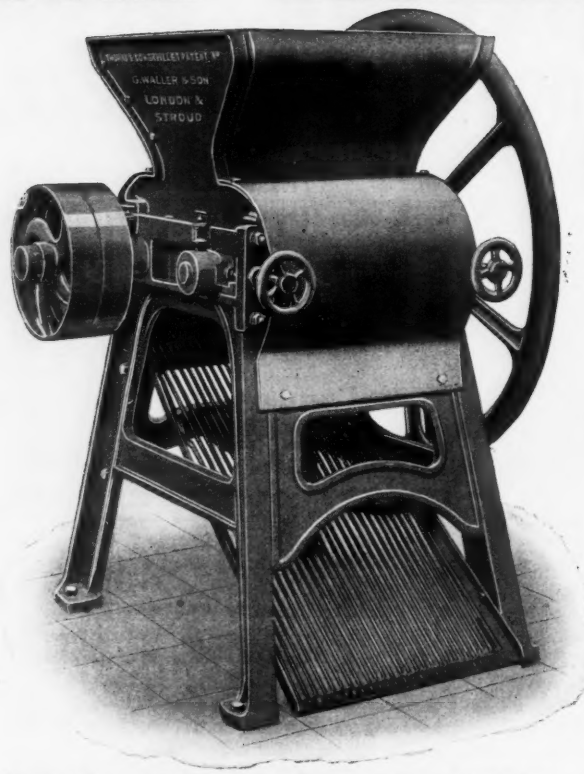


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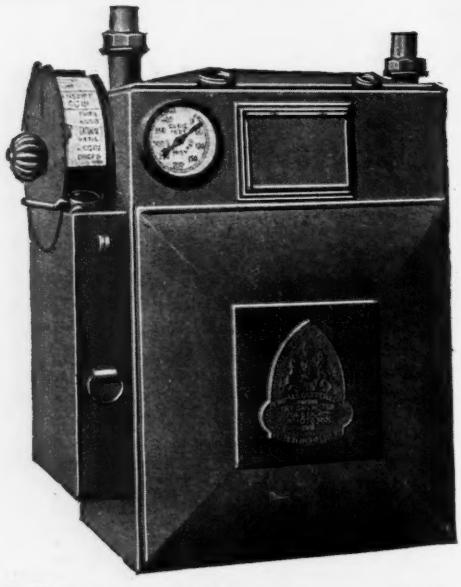

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## EDITORIAL NOTES—GAS, &c.

### Points from the Session's Work.

IN resuming the review of the work of the Parliamentary Session as affecting gas supply, it may be stated that the number of private measures introduced (omitting Provisional Orders) in which gas was, entirely or partly, concerned was 29, and 22 have succeeded, with more or less amendment, which will be dealt with when the prints of the Acts are all available. The seven Bills that have fallen are easily accounted for; and in most cases they suffered extinction at quite an early stage of their career. The Bradford, Fermoy, and Sheringham Bills, proposed the purchase of gas undertakings; but in the Bradford and Sheringham cases, it was not Parliament but the ratepayers who put an effectual end to the schemes soon after birth. The Bradford Bill proposed the purchase of the Pudsey and the Drighlington and Gildersome Gas Companies; the Fermoy, the local undertaking; the Sheringham, both the gas and water concerns. The Bill proposing incorporation for the Biddulph, Bradley Green, and Black Bull Gas Company was dropped almost as soon as lodged; the Lisburn Gas Company's Bill was withdrawn (on an agreement for purchase) in favour of the one promoted by the District Council for the compulsory acquisition of the Company's property; the Salford Corporation Bill was withdrawn under the circumstances narrated last week; the Amman Valley Gas Bill—around which hangs a tale of sordid promoting craft and cupidity—also went under on an agreement with the promoters of the Ammanford Bill for the transfer, on arbitration terms, of the works that were inoperative for want of powers. It was the only way out of an uncomfortably tight position for the promoters of the Amman Valley Company. Of the Gas Bills that succeeded, there were few that were opposed; and those that had to meet a contest in the second House can be counted upon the fingers of one hand. Most of those that avoided actual opposition had petitions lodged against them in the beginning of their parliamentary course; but settlements were effected in the majority of cases, though not in all did they succeed in escaping unscathed from examination by the Unopposed Bills Committee, who in several cases made changes, either on their own initiative or through the representations of Government Departments.

While the authorities have exhibited a change of front in respect of the matters referred to in the article last week, in other directions in which change is desired they are inflexible; and in certain ways there is not consistent practice on their part. In the matter of the supply of power gas by Companies, the Unopposed Bills Committee in two cases have refused clauses proposing to authorize such supply. The Leyland and Faringdon Gas Company desired to be empowered to supply "Mond" gas; but the Committee stated that they were not in favour of granting powers for something for which there may not be a demand. In the case of the Heckmondwike and Liversedge Bill, power gas clauses were also refused by the Select Committee; and the promoters were told to wait until the matter had become one of "practical politics." If gas undertakings wait for the maturing of this condition before seeking the power to supply, they may be the losers of the business; for manufacturers cannot delay fitting up their factories with power while a gas company or a gas committee go through the process of making application to Parliament to obtain sanction to supply the industrial needs, and have then to lay down the producing and distributing plant. But here we have one of the several anomalies in parliamentary procedure, which is that, if sanction to supply power gas is required by a gas undertaking, it is better that the Bill should be opposed, and go before a Select Committee in the House of Commons rather than before the Unopposed Bills Committee. Several gas companies have secured the right to supply power gas in past sessions; and the Aldershot Company have done so in the present one, subject always to the conditions applying to power gas supply, and any regulations hereafter made by the Home Office. The Harrogate Company, too, have, under these conditions, been authorized this session to undertake the provision of suction-gas plant where required. This inconsistency of the parliamentary authorities is undesirable. Gas undertakings are becoming more and more the centres for the supply of gas for all purposes; and it is better in the public interest that the business should be concentrated in their hands as much as possible. To that end Parliament should render aid. However, notwithstanding the expansion of the business of gas undertakings, Mr. Emmott, the Chairman of the Unopposed Bills Committee, and his colleagues entertain doubts as to the future of the gas industry. They are peculiar in this. But the fact remains that, in dealing with the Swinton and Mexborough Gas Board Bill, the Chairman stated that "the mind of the "Committee is set against any increase, and, in fact, is rather "set on a decrease, in the number of years they are likely "to allow for the purchase of gas-works, because of the "somewhat doubtful character of the undertaking in future." We are inclined to think that it will be better for the Committee to continue to entertain this view; for what with the limitation of profit appropriation and a decrease in the number of years allowed for the repayment of the purchase money, gas undertakings will assume less eligible proportions of favour in the eyes of local authorities as subjects for expropriation.

There is rigorous adhesion on the part of the authorities to the 14-candle gas standard for illuminating power, as now inserted in the model clause. All the Gas Acts, save one, this year dealing with the question will contain the 14-candle standard. Local authorities, as well as gas companies, are unanimous in applying to Parliament in these days for a reduction to the 14-candle level, with the "Metropolitan" No. 2 argand as the test-burner. It is a pity local authorities who come to Westminster to oppose the reduction of illuminating power and the new test-burner do not appreciate how futile and quixotic is their procedure, and that it means certain defeat for them. More than once during the present session, Chairmen of Committees have put an end to the waste of public time in this matter; and it is hoped that the session will have witnessed the end of so useless and senseless a proceeding on the part of ill-advised local authorities. Through the passing of the Gaslight Company's Act, London will, as from Jan. 1 next, be entirely under gas supply with a 14-candle standard; and in not a single instance has there been refusal of an application for the 14-candle standard, accompanied by the No. 2 burner. The only Act in which a lower standard—12 candles—is mentioned is that of the Bury Corporation; and, in this instance, it was allowed in view of the fact that the Corporation had previous full liberty in the matter of illuminating power.

The session has, in two respects, been made epochal by the Act of the Gaslight and Coke Company—first, there is the advent in it of a calorific power clause, and, secondly, it marks a territorial change in Metropolitan Gas Supply. From both possibly greater things will ensue. A calorific power standard is a certainty of the future. This introduction will most probably hasten it; but it must be vigorously resisted until the illuminating power standard has been completely annulled. The Gaslight and Coke Company merely assented to the dual penalty test with the greatest reluctance, and solely as being expedient to the safety of their special plans. It is an agreed introduction; and Parliament, though pressed (in view of it) to insert a calorific standard in the Coatbridge Gas Order at the instance of the

Corporation, declined in both Houses. It is to be hoped that Parliament will never commit the injustice of inflicting upon gas suppliers two concurrent standards for quality. There are some gas men who are hoping for complete emancipation from qualitative episcopy; but we are afraid that they are allowing their hopes to fly too high. Under the granting of statutory privileges, it will only be by the substitution of some fresh standard that the worthless illuminating power standard will be allowed to become extinct by Parliament. Not in respect of gas qualitative powers, but in connection with the annexation by agreement of the West Ham Gas Company's district, powers, and property, the Gaslight Bill was opposed in both Houses by the West Ham Corporation only; and week after week in the House of Commons the Bill was blocked by Mr. Thorne on their behalf. The economic advantages of the amalgamation scheme, however, were proved up to the hilt in both Houses of Parliament. The greatest concession the West Ham Corporation secured—and this owing to the desire of the promoting Company to work on a friendly footing—was the agreement that the West Ham works should be continued for a decade on substantially the same scale as prior to the promotion of the Bill, although the insatiable West Ham Council wanted twenty years, with the agreement extended to labour being continued over that period on a like scale. With the great changes in the occupation of labour in the gas industry—the industry gives employment to more labour now than ever before in its history—the condition could not be conceded, nor would Parliament compel such an unreasonable stipulation, nor the one as to the twenty years. It is possible that this amalgamation is but the forerunner of other changes of a like nature in connection with the Metropolitan Gas Supply.

The Alliance and Dublin Consumers' Gas Bill was very keenly contested, and ended (by agreement and not by compulsion) in some facial changes in the measure of extreme financial importance to the Company. They cannot all be detailed here. The standard price was reduced to 3s. 7d.; but there was an agreed unprecedented condition that for three years the price of gas is to be regulated by the cost of coal. The charge of 3s. 4d. for gas is not to be exceeded so long as the average price of coal is 13s. 6d. per ton c.i.f. For every 1s. the price of coal rises above 13s. 6d., an extra 1d. per 1000 cubic feet may be charged; while for every 1s. the average price of coal falls below 13s. 6d., the charge for gas is to recede by 1d. There are obvious objections to the arrangement in the circumstances of the Dublin Company; but, on the whole, there is no doubt the Act will eventually prove of great benefit to them.

Several gas undertakings have secured extensions of areas; and, in two or three instances, projects for the purchase by gas companies of small undertakings in the extended areas have been ratified. The session has also supplied its illustrations of the folly of neglecting opportunities in respect of both the exercise of powers and the confirmation by Parliament of supply operations in excess of statutory authorization. Four Purchase Bills have succeeded this year—the Lisburn, by agreement; the Swinton and Mexborough, under a purchase clause inserted in the Company's Act last session; the Risca; and the Prestatyn, by which a privately owned concern is to be acquired. In the Heckmondwike and Liversedge Gas Company's Act, a suspensory clause has been inserted on the lines of the Merthyr Tydfil Act of 1906. In that session also a similar clause was embodied in the East Hull Act. The ratepayers of Merthyr refused to endorse purchase by their Council; the Hull Corporation were defeated when they came to Parliament with a Purchase Bill in 1907; and the District Council who obtained the insertion of the suspensory clause in the Heckmondwike Act this session have not a brilliant record to present to Parliament to show their qualification for the management of the local gas concern. On the whole the Heckmondwike Company have not much to fear. The electricity powers obtained by the Aldershot and the Yorktown and Blackwater Companies should be noted, as being the most extensive electricity supply authorization yet granted to gas companies. Only one other point is of sufficient importance for special reference; and it is that the session has seen the supersession of the Police and Sanitary Regulations Committee by the Local Legislation Committee, with extended powers, and directions for unifying, as far as circumstances allow, the legislative projects for local government that come before them. In view of this direction, the limitation of profits in the case of Oldham (as mentioned last week) is significant.

## Considerations Affecting Rates of Increase.

The half-yearly statements of all the London and Suburban Gas Companies have now been issued, and meetings of the proprietors held. It will have been observed, from the reports and the Chairmen's speeches, that the variations in business expansion have been somewhat striking. The rates of increase, represented as percentages, have not been, in several instances, of the order that were witnessed at one time of day. It cannot be admitted that the weather of the half year had much to do with this. Depression of trade, and consequent unemployment, had; so had the continued increasing use of the lower consumption inverted incandescent burners. The competition of electricity cannot be credited with having made any substantial additional impression upon the gas business; inasmuch as, on all hands, the general complaint of electrical managers is that their lighting business has diminished, that the records show but comparatively few extra lighting consumers enrolled, and that additional business is mostly in the power line, through displacement of steam-engines, or else the starting of new factories. Last year being leap year, the past six months suffered in comparison the loss of a day; and a day's consumption in February is of considerable consequence. Its addition would have made many a figure representing, for London and the suburbs, the percentage of consumption increase go up one figure on the left-hand side of the decimal point, and would have turned a fractional decrease in the case of the South Metropolitan Gas Company into an increase of some 0·39 per cent. The other Companies in and about London reported these percentage increases in consumption: Brentford, 3·2; Commercial, 2·3; Croydon, 2·5; Gaslight and Coke Company, 0·7; South Suburban, 2·5; Tottenham, 8·3; Wandsworth 3·2; West Ham, 5·5.

These variations in increases in consumption, it is patent, are not so much due to the prices charged as to the conditions existing in the locality. Reductions no doubt stimulate consumption; but, advocates as we are of the lowest possible price, we are compelled to realize that lowness of price alone is not sufficient to maintain for any concern a uniform rate of increase in consumption. For instance, the Wandsworth Company are now supplying at 1s. 11d. per 1000 cubic feet; and their increase was 3·2 per cent. last half year. Brentford, with a 2s. 9d. price, also had a 3·2 per cent. increase. But the Wandsworth 3·2 per cent. increase did not represent such a large volume of gas as in the case of the Brentford Company, seeing that the respective sales of the Companies were 544,581,000 and 1,342,560,000 cubic feet. Then, again, take Croydon with its 2s. 8d. price, and its increase of 2·5 per cent. The West Ham Gas Company, charging the same price, had an increase of 5·5 per cent. And the Croydon increase was only on a consumption of 620,753,000 cubic feet, as compared with 915,419,000 cubic feet in the case of the West Ham Company. Then there was the South Metropolitan Company, charging only 2s. 3d., but showing a fractional decrease in consumption; while the Tottenham Company, charging 2d. more, had an increase in consumption of 8·3 per cent. But the total sales of the Companies were, respectively, 6,286,736,000 cubic feet and 725,018,000 cubic feet. In comparing certain of the percentage figures, regard must, of course, be had to the volume of gas they represent. A uniform volume of increase may continue year after year; but there will be a gradual decline in the percentage figures the volume represents.

However, the figures quoted are the proof that to price cannot be assigned the discrepant experiences in increases of business. Local circumstances—particularly local development or stagnation in building—have, it is clear, a larger influence. Districts seem to go through—independent of any general trade conditions—a (so to speak) cycle of prosperity and depression peculiar to themselves. New estates are opened up, or old houses are replaced by new; and the popularity of these new and modern equipped houses rob the districts containing the older order of property of a part of their tenants. But the time comes when what was once new and magnetic loses those virtues; and a change again sets in. At present London and the inner suburbs have an extraordinarily large number of empty houses; and the fact is interesting in considering the latest returns as to the rates of increase in gas consumption. According to some statistics that Mr. John Burns, in reply to an inquiry, presented recently in the House of Commons, it is found that, in 26 of the Metropolitan boroughs (no information was available for Wandsworth and Southwark), there are no less

than 45,500 empty houses and tenements. There is much speculation as to the cause of this. One authority puts it down to the want of employment, and to the removal of some large industrial establishments from London. A prominent example is the removal of the London and South-Western Railway works from Nine Elms to Eastleigh, which, it is calculated, has taken from 2000 to 3000 families from Battersea and Wandsworth. Cheapness of transit is also responsible for some migration to the more distant outskirts; and to over-building is due a part of the empty property. This is an interesting matter for examination, deduction, and conjecture. But unlet property diminishes the scope of the gas business; and as most tenantless houses have gas-services running into them, there is represented a substantial amount of unproductive capital. What is one concern's loss in revenue, is always another concern's gain. In that, however, there is poor consolation for the concern whose new business is shown at a diminished rate by this and the other causes. To the revival of local industrial activity, we must look for a better state of things. Our local authorities seem to find it hard to learn the simple lesson that it is by the encouragement, and not by the repelling, of industry that localities maintain the highest level of prosperity. For the well-being of a district, it is more important to keep industry within its limits, than lavishly expend money on certain less productive (but rate-increasing) objects that will occur to most readers with knowledge of the affairs of local government.

## Breakdowns of Gas and Electrical Machinery.

THE axiomatic saying that as much is learned from failures as from successes is particularly applicable to machinery; but we fear the lessons of failures are not taken to heart so completely as is desirable in the interests of owners. If they were, the annual report of Mr. Michael Longridge on engines, boilers, and electrical plant would not year after year record so many accidents of previously experienced character that are traceable to faulty design, negligence, and indolence. But their recounting is educationally beneficial. Men as well as machines change; and the causes of trouble with the latter are, naturally, not so well known to the younger men as to those to whose places they have succeeded. Their nescience in this particular is due to inexperience, and not necessarily to personal apathy. Furthermore, though it is quite impossible to make anything mechanical so perfect that it can be categorically asserted to be proof against mishap, the statement of the ascertained grounds of failures all help, or should help, to improvement in design, protection, and certainty. No small part of the advances towards mechanical perfection are due to the failures of a past day. For these and other reasons that will readily occur to mind, the hope may be expressed that Mr. Longridge will not, in his future annual reports, curtail the practical experiences of the year in respect of internal combustion engines to the narrow limits that he has done in the one reviewed elsewhere this week.

Taking steam and gas engines and electrical motors on direct current, it is interesting to notice the correspondence in the report of the ratios of breakdowns. In steam-engines, the failures were equal to 1 in 9·4; in gas-engines, 1 in 9·1; in direct current electric motors 1 in 9·2. In motors on alternating current, the ratio was 1 in 11·3. In starters and controllers, the ratio was 1 in 24. In regard to dynamos, the failures with direct current were 1 in 13·7; but, with alternating current, there is a bad return—1 in 5·7. The figures given in the tables should serve as a guide to the parts to which it is essential manufacturers should direct more attention with a view to improvement, and so helping to avert the troubles to which the users of their engines or motors are exposed. For example, in connection with gas-engines, there is continued evidence of weakness in the design and manufacture of valves and valve gear; the percentage of failures in these respects being very large. It is also amazing that there should be such an amount of inexcusable neglect on the part of users as to produce the high percentage quoted of preventible accidents. In illustration, observe the considerable increase in the percentage of cracked cylinders and cylinder ends, which are mainly due to jackets being left undrained and exposed during frosty weather. If there were less carelessness, there would be fewer accidents.

Though electric motors are of comparatively recent introduction into industrial operation, they are showing signs of rapid deterioration and extending unreliability. The breakdowns reported are annually increasing, as is also the cost of repairing the damage occasioned. Mr. Longridge describes the increase in the cost of repairing electrical plant as being "great;" but, looking on the bright side of the matter, he suggests that probably this is temporary rather than chronic, owing to expensive failures of a few large generators. In the statistics for the electrical plant (it is only fair to point out), the common experience of dirt and neglect is found; but the percentage of breakdowns through age and deterioration figure somewhat high. And—this is not unusual with electrical plant and other occurrences in which electricity plays a part—the percentage of unascertained causes of failure is remarkably high. But notwithstanding the testimony of practical experience, and the fact that Mr. Longridge takes no account of failures caused by the stoppages of the energy, our electrical friends will, it may be expected, continue to circulate among manufacturers legendary statements as to the superior reliability of electrical motors compared with internal combustion engines.

## Future Development of the Gas-Engine.

THE paper prepared by Mr. Dugald Clerk on the work of the British Association Committee on Gaseous Explosions, shows distinctly two things—that the Committee (whose elaborate report will be published in succeeding issues of the "JOURNAL") have not yet made any great headway with their work; but, on the other hand, they have arrived at clear conclusions as to the lines that their work must pursue. The tangle into which gas-engine research had fallen (before the Committee took up the matter) through individual investigation following the bent of individual thought and fancy was made abundantly clear at former meetings of the British Association; and it was then seen that nothing but systematic inquiry by the union of the wisdom of recognized experts would clear away the discordant findings and errors of the individual, though admittedly earnest and enthusiastic, workers. The eminent members of the Committee, and their no less eminent associates, are now at work on the numerous problems that it is requisite to solve for the advance of essential knowledge, and consequently for the pronounced definition of the lines upon which to proceed in order to derive increased working efficiency. That they have not got far into their work is due to the expanse and intricacy of the inquiry involved; but it is to be hoped that another twelve months will see at all events more definite fruit from their labours, as indicated by Mr. Clerk. The Committee are directing their investigations to the physical and chemical properties of gaseous explosions and the combustion products resulting therefrom; for with all the inquiry there has been by physicists, engineers, and chemists, there has been failure to obtain complete knowledge of these fundamental essentials to further progress in the working efficiency of the internal combustion engine. It appears plain, from Mr. Clerk's review of the position, that we must not expect any substantial increase in indicated thermal efficiency under existing circumstances. The possibility of increase will depend mainly upon considerable alterations in the actual thermal cycle used; any substantial additional development being unlikely on the old lines of increasing compression. Nevertheless, the efficiencies attained at present are good; the table given in the paper showing that between 1882 and 1908 the indicated thermal efficiency increased from 16 to 36·8 per cent. When the Committee present us with a report on the results of their investigations into temperatures, specific heats, heat flow, and other matters, then the mechanical problems of the gas-engine can be attacked in the light of that knowledge. Looking at the weight and bulk of large gas-engines in proportion to the power developed by them, there is no doubt that they do require more attention on the mechanical than on the thermodynamic side.

### Income-Tax Allowance in Respect of Depreciation.

Reverting to the editorial article in last week's "JOURNAL" on the above subject, it may be well to point out to all gas companies the importance of keeping a watchful eye at the present time on their communications with the Surveyors of Taxes of the Board of Inland Revenue. Mr. W. A. Schultz has taken up this matter, and is in communication with some of the principal gas companies, and also with the Gas Companies' Protection Association, with a view to promoting concerted action. In the meantime, memoranda are being sent out by Surveyors of Taxes, of which we have a copy before us, to the following effect: "Sir,—A scheme

has been drawn up by the Board of Inland Revenue as to depreciation and renewal allowances, a copy of which I send you. From it you will see that depreciation is not to be allowed. Kindly inform me on opposite page if you accept the scheme for 1909-10." It is clear from this that Surveyors throughout the country are being instructed to obtain the consent of gas companies individually to this so-called scheme; and we strongly advise any who receive similar communications to the one just quoted, to either give a negative reply, or altogether withhold an answer and in the meantime communicate with Mr. Schultz, at No. 50, Cannon Street, E.C., or with the Secretary of the Gas Companies' Protection Association (Mr. F. E. Cooper, No. 5, Victoria Street, Westminster). We are glad to see, from the letter by Mr. H. E. Jones in our "Correspondence" columns, that this central watching organization is thus promptly moving in the matter, as it is not a question that can be left indefinitely in abeyance; and the sooner the Inland Revenue authorities learn that gas undertakings are prepared to unite in resisting their ruling (as explained last week, pp. 556, 585) in this regard the better.

## Salford and the Gas Profits.

It is hoped the out-districts of Salford will treat the resolution passed by the Salford Corporation last Wednesday with the contempt that it deserves; for, in its tail-part, a more puerile and injudicious resolution could not have been passed by a municipal body of the position of that at Salford. The Corporation are still smarting under the decision of the House of Lords Committee as to the limitation of the profits appropriated from the gas undertaking in aid of the rates, and the enforced withdrawal of their Bill to prevent this decision becoming irrevocable and operative. It would have been an excellent thing for the repute of municipal trading, and for the gas consumers, as well as an earnest of the Corporation's desire, in the finance of local government, that there should be equality in the matter of taxation, if the Council had accepted the decision, and run the undertaking as it should be run by a local body—for the purpose of giving the cheapest possible service. The outside districts, in their opposition to the Bill, were those who convinced the Lords Committee that unlimited profits were antagonistic to the best interests of the consumers, and that the application of unlimited profits to the purposes of the borough inflicted injustice on the gas consumers generally and the out-districts in particular. The scrapping of the Bill necessitated the out-districts doing something to realize the fruit of their victory; and their proposal to promote next session a Bill to give effect to the decision of Lord Donoughmore's Committee, has brought an answer from the Corporation in the adoption last Wednesday of the absurd resolution, authorizing the Gas Committee to enter into negotiations with the out-districts with regard to the supply of gas, and, in the event of a reasonable understanding not being attainable, the Committee are to intimate that the Council will seek relief from the obligation to supply those districts with gas. The only terms on which these districts should come to an undertanding are those indicated in the Lords' decision, supported as it is by the one in regard to Oldham. Of this the out-districts and the Salford Corporation may be sure, that the final words of last Wednesday's resolution will be, if there is a contest in Parliament next session, to the disadvantage of the Corporation. We repeat that the open threat is both puerile and injudicious; and the Council have been very ill-advised by their Committee.

## Steel Mains for Gas Undertakings.

Those who read through the account appearing to-day of the opening of a gas-works at Stanford-le-Hope (which is situated in an Essex agricultural district towards the mouth of the Thames) will see that, though the undertaking is, at the present stage, only a very small one, everything about it is nevertheless quite up to date—in one respect, notably so. The retorts are fired on the regenerative principle; the gasholder is a spiral-guided one; and the street-lamps start their career with gas as an illuminant on the incandescent system. But the most noteworthy feature about the Company—who have had the benefit of the advice, in the capacity of Consulting Engineers, of Messrs. Corbet Woodall and Son—is the fact that all the mains on the district, of which about 5 miles have so far been laid, are Mannesmann steel tubes. In size, they range from 6-inch to 2-inch; and the joints are of the "rigid" type, caulked with lead wool. Steel tubes have also been used for the service-pipes, all of which, whether to houses or lamps, are connected by the Woodall-Parkinson expansion-nipple. There are also, as has been pointed out in a previous issue, other considerations than the design and construction of the works which should be sources of satisfaction to the inhabitants in connection with their gas undertaking.

## Interesting Results from Zurich.

The report of the Zurich gas undertaking for last year, of which a summary is given in another column, is especially interesting, in that it displays the advantages which have been found to accrue from the introduction of vertical retorts. During the year, approximately half the coal carbonized was dealt with in inclined retorts, and the remaining half in the new settings of verticals. Steam was introduced into the latter. The result has been that the make of gas per ton of coal carbonized works out at 2336 cubic feet more for the vertical retorts than for the inclines. The verticals also show a slightly increased yield of ammonia; but, on the other hand, they have caused a considerable reduction in the amount of prussian blue obtained from the cyanogen washers. The report also discloses some suggestive figures in regard to the make of gas per man employed in the retort-house. A few instructive remarks are also made as to the manner in which the heats of the vertical retort-settings are controlled at these works. For the rest, the report displays the satisfactory growth in the consumption of gas which for some years past has been a conspicuous feature of the working of the Zurich gas undertaking. The net profit for the year is, as usual, very satisfactory, and reflects great credit on the ability with which the works are administered under Herr A. Weiss, the Engineer and Manager.

## The Sequel to Certain Promotions.

Is it not time that the authorities whose duty it is, in the protection of the public, to interest themselves in the matter of doubtful promotions of commercial undertakings bestirred themselves to make inquiry into the promotions of gas and water concerns in respect of which receivers and managers have recently been appointed, in order to see whether or not there is anything about them that calls for action on their part? Modest paragraphs that have recently appeared in our columns announce the appointment by the High Court of receivers and managers in connection with the East Sussex, the Laindon, the Robertsbridge, and the Rawcliffe Companies; and not long since the Amman Valley wreck was prominently in evidence. This run of motions for the appointment of receivers and managers points to the questionable genuineness of the flotations in the first instance, having regard to the capitals raised and to the part of the proceeds allocated by the promoters to themselves. The public authorities whom we have in mind would find the specious prospectuses that were issued in connection with the above-named concerns of peculiar interest at the present time. They might also with advantage study the preambles of the Amman Valley and Ammanford Bills in the present session of Parliament, as well as the comments that have from time to time appeared in the "JOURNAL" on the affairs of the other Companies in connection with which receivers and managers have been appointed.

## The Effects of a Coal Strike.

A little late in the day, perhaps, but welcome for all that, is the remark that may be applied to an article on the late coal crisis which has recently been written by Mr. John Wilson, M.P. What he has to say would undoubtedly have been more useful at the time when the miners were balloting upon the question of whether or not, in certain circumstances, there should be a "national strike;" for there is good reason to believe that the consequences that would have attended such a struggle were not sufficiently before many of their minds when they cast their ballot for a strike. These consequences, as he points out, would have been general stagnation through every part of our commercial life, and inconvenience in the home, and that in millions of them there would have been poverty and no means of relief. Mr. Wilson is of opinion that there can hardly have been a man, on the workers' side at least, who did not feel as if a great weight had been removed from him when, by the action of the President of the Board of Trade, the difference in the Scottish coalfield was

settled; and he states that he has never known a workman to show anything but gladness at the passing away of the calamity. This really does not seem so much to bear out the idea that the ballot was cast without consideration, as to prove that many men must have voted against their own convictions. If, however, it is correct, there is some consolation in the statement; for future proposals in the direction of "national strikes" should fall decidedly flat among that class who would undoubtedly be the greatest sufferers from such an event—namely, the employees. A strike of this kind, as Mr. Wilson says, could not in any event have been of benefit to any party or person, and would have been calamitous to the trade of a great industrial nation like ours. In explanation of his silence just at the time when outspoken opinions would have been of the greatest value, Mr. Wilson states that when it was decided by the Miners' Federation conference to take the ballot, it was likewise determined that no one should give advice to the members, but that they should be left without guidance. It was grievous to him to remain silent in an important crisis like this; but he resolved to abide by the decision, even while he felt it was not the position for leaders of men to take. It certainly seems to us that it was not. The men look to their leaders to lead; and this expectation should be satisfied on all occasions, and not merely on some, as appears to be the case. Altogether, the miners' ballot can be likened to a general election without any speeches or addresses. In such an event, many voters would feel considerable difficulty in coming to a wise decision.

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**Marriage of Mr. L. J. Langford.**—At the Parish Church, Longton, last Wednesday, the marriage was solemnized of Mr. Leonard James Langford, third son of Mr. William Langford, the Corporation Gas and Electrical Engineer, and Miss Beatrice Webberley, fourth daughter of the late Mr. John Webberley. There was a large gathering. After the ceremony, the wedding party assembled at a *déjeuner* at the residence of the bride; and later in the day Mr. and Mrs. Langford left for Ilfracombe. The bride and bridegroom received a handsome collection of presents; the father of the latter giving a cheque and a silver tea and coffee service. Mr. Leonard Langford was formerly with his father at Longton, but is now Manager of the Abertillery Gas-Works.

**Internal Protective Coating for Water-Pipes.**—Experimental researches carried out by M. Ferrier, a chemist of Vitré (Ille et Vilaine), have led him to the conclusion that only slightly mineralized water, like that of the Brittany region, attacks lead or iron pipes. In the first case, the water carries along with it very noxious lead products; and in the second, insoluble iron compounds are formed which clog the pipes and absorb the dissolved oxygen. Internal application of coal tar protects cast iron for a time, but not wrought iron, which is used for the small branches. Pipes lined with enamel, glass, or tin are both expensive and fragile, moreover they are not practicable. The remedy proposed by M. Ferrier is the artificial mineralization, by the addition of lime, of all water containing less than 7 centigrammes of lime per litre. The pipes then become coated, and are thus protected. The quality of the water is improved by the partial precipitation of germs and organic matter; also by enrichment in lime, on which its potable value depends.

**Treatment of Volatile Products of Tar.**—A process for the continuous extraction, purification, and rectification of the volatile products of tar is the subject of a French patent taken out by M. Barbet, whose specification is abstracted in the current number of the "Journal of the Society of Chemical Industry." The crude tar is fed from an overhead store-tank into a tubular heater, where it serves to cool the naphtha vapours and then passes down a column into a boiler, where it is heated by high-pressure steam. The vapours pass into a rectifying column, from which at different points very pure benzol, toluol, and xylol are separately withdrawn, condensed, and cooled. The tar passes from the first boiler into a second similar one, also steam-heated, where the heavier naphthas are driven off, and are condensed in the tubular heater mentioned above. The tar then passes through a series of stills, provided with agitators, set in brickwork. The last still of the series is heated by direct fire; the waste gases serving to heat the other stills. Carbolic oil, creosote, and heavy oil are driven off, cooled in air condensers, and collected; and soft pitch flows away continuously from the last still. The heavy oil may, if desired, be passed through a "cracking" still heated in a lead bath in order to dissociate it into lighter products. The carbolic oil is passed continuously through a series of conical vessels packed with materials presenting a large surface, and a stream of caustic soda solution is sent through the series in the opposite direction. Washed creosote issues from one end of the series, and, after treatment with sulphuric acid, is fractionated in a continuous column still. The sodium phenate which issues from the other end of the series of washers goes through a decomposer, where it is treated with acid or acid sodium sulphate, and the separated crude tar acids flow away into a store tank. They are then passed down a continuous column still and fractionated.

## GAS STOCK AND SHARE MARKET.

**(For Stock and Share List, see p. 649.)**

BUSINESS on the Stock Exchange last week presented at least one welcome feature, and that was a fair increase in the volume of transactions. The tendency varied from time to time, with alternations of cheerfulness and depression. The opening day took the favourable line, actuated to a great extent by a recovery in the depressed American Market. Consols rose $\frac{1}{16}$; Railways and the Foreign Market were fairly bright; and Africans were better. In Gas, Tottenham and Bombay advanced. Tuesday was pretty active and cheerful. Buyers were tempted into the gilt-edged market, and Consols rose $\frac{1}{4}$; but Railways were rather weaker. Gaslight and South Metropolitan debentures advanced. Wednesday was not nearly so good. Rails were decidedly flat, and Americans were dull; but the gilt-edged class were still in demand, and foreign issues were fair. Buenos Ayres Gas advanced. On Thursday, things brightened up. Business in Home Government securities increased, and Consols rose $\frac{3}{16}$. Foreign stocks were good, and Americans calmer; but Railways could not mend. On Friday, after a fair opening, dulness supervened. Consols were lower, and many others dull. On Saturday, matters were tolerably active for an Autumn Saturday, and were fairly steady; but Consols fell another $\frac{1}{4}$. In the Money Market, there was no movement; the abundant supply for short loans, and the easy tendency of discount rates, remaining unchanged. In the Gas Market, there was fully shared the general increase in activity which characterized most departments. Prices were steady and mostly unchanged; but wherever there was a change, it was in the upward direction. In Gaslight and Coke issues, the ordinary was active at the old prices, transactions ranging from $104\frac{1}{8}$ to $104\frac{13}{16}$. In the secured issues, the maximum marked 88, the preference from 104 to 105, and the debenture from $85\frac{3}{4}$ to $86\frac{3}{4}$. South Metropolitan was much more active, with transactions at from 119 free to $120\frac{5}{8}$. The debenture made $85\frac{1}{4}$. Commercials were again untouched. Among the Suburban and Provincial group, Alliance and Dublin old changed hands at $18\frac{1}{4}$, Bradford old at 251 and $252\frac{1}{2}$, British at $43\frac{1}{8}$, Bromley "C" at $107\frac{3}{4}$, and Tottenham "B" at $110\frac{1}{2}$. In the Continental companies, business was quiet. Imperial showed only two or three bargains at 180 and $180\frac{1}{4}$, ditto debenture realized $96\frac{3}{4}$, Union from 95 to 96, and European was not dealt in. Among the undertakings of the remoter world, Buenos Ayres changed hands at 14, Cape Town debenture was several times dealt in at from $82\frac{1}{2}$ to 83, Monte Video realized $12\frac{7}{8}$, Primitiva $7\frac{3}{32}$ and $7\frac{1}{8}$, ditto preference $5\frac{1}{4}$ and $5\frac{5}{16}$, River Plate from $16\frac{3}{4}$ to 17, and ditto debenture $97\frac{1}{2}$ and 98.

## ELECTRICITY SUPPLY MEMORANDA.

**Municipal Accounts—Deficits and Slim Surpluses—Metallic Filament Effects—Power Profits and Other Points—The Finance of Metropolitan Municipal Undertakings—The Relief of Bath—Wiring and Fittings Powers Abandoned.**

THE accounts of most of the municipal electricity departments have now been published. Some of them show excellent surpluses; but the majority contain disfigurements caused by the depression of trade, the whittling down of consumptions by the metallic filament lamps, and the extension simultaneously of the demand for cheaper units for power purposes. If the accounts are examined in detail, it is seen that many an undertaking would have been in worse financial plight if costs had not exhibited a diminution. Coal cost less than in preceding years; and not a few accounts show the use of the pruning knife on the expenditure side of the revenue account. Supposing an increase in the price of coal at this stage when the consumption of the biggest profit-producing units is on the decline, and the low revenue-yielding power units are on the increase, and when many undertakings are finding their maintenance charges tending upwards, the result would be to largely swell the number of undertakings exhibiting deficits. There are several undertakings showing substantial deficits to-day; and a greater number that, partly by the assistance of the art of accountancy, exhibit a very lean profit. It would not take much in these instances to throw the balance to the other side under the sensitive and critical circumstances of the times. A complete list has not been compiled by us of such undertakings; but the one that has been prepared is sufficient to give point to the views formed from the survey of the financial statements. The electrical industry is fighting hard against altering established financial methods in the conduct of business; but the time cannot be far distant, if we read the signs rightly, when there will have to be a considerable change.

As illustration, among the undertakings that incurred deficits in the financial year 1908-9 are these: Acton had a loss of £4943 (against £2935); Barnstaple (after taking credit for £200 pupils' premiums), of £476; Bath, £1661; Batley, £308; Bridlington, £188; Dover, £1980 (the year before £2147); Hastings, £3805 (previous year £2982); Marylebone, £3930; Middleton, £822; Morecambe, £2628; Morley, £1799; Stalybridge, Hyde, &c., Board (excluding the tramways), £528; and Sunderland, £2965, against £1908 (this town has had to face stern depression in the shipbuilding industry). From these particulars it will be seen that the towns with deficits are fairly scattered over the country;

and this is accentuated when the sample towns are quoted that were close on the division line between surplus and deficit. Among accounts exhibiting slender surpluses are these: Aldershot, £183; Bermondsey, £123; Bexhill, £536; Blackburn, £976 (against £1443 the previous year); Brighton, £564; Canterbury, £93; Cardiff, £311 (but there is an accumulated deficiency of £5851); Colchester, £269; Devonport, £790; Finchley, £86; Gloucester, £10; Govan, £528; Hornsey, £189; Ilford, £1 (!); Keighley, £30; Kirkcaldy, £147; Lancaster, £711; Leigh (Lancs.), £360; Mansfield, £700; Nelson, £36; St. Helens, £376; Southwark, £849; Stockton, £626; Warrington, £942; West Bromwich, £988; Weymouth, £101; Worcester, £160; Yarmouth, £194.

Several undertakings show largely decreased surpluses; an outstanding one being Manchester. The cotton strike, as well as the introduction of metallic filament lamps, has injured the business of several Lancashire undertakings. The total receipts of the Manchester concern amounted to £367,240, against £384,602 in the preceding year. The net surplus was £12,000, as compared with £19,543. Notwithstanding this, the sales increased by upwards of 3 million units, which is traceable to power supply. In this connection some remarks accompanying an analysis of the accounts in the "Electrical Times" are of interest: "As might be expected, the new business pertains almost entirely to the supply of energy for power purposes; and this, combined with a reduction in the tariff for lighting which came into force early in the year 1908, will account for the lessening of the average receipts by 0·14d. per unit—a figure insignificant in itself, but one which represents a diminution of no less than 10 per cent. Small wonder then that the gross profit shows a shrinkage of £22,000, and that the surplus, after allowing for increased charges, is affected to an even greater extent. . . . Although the amount set aside for renewals is smaller than for many years past, it is only fair to point out that the sum available for renewals and reserve is still in excess of £141,000." Glasgow is another interesting case. The accounts show a deficit of £3544; but this is after writing off £53,259 depreciation on capital account. Metallic filament lamps and bad trade caused the revenue to fall by some £8000; but there was a saving of working expenses amounting to £10,415. On the other hand, £4000 extra had to go to the sinking fund, and £3108 for depreciation. Leeds shows a net surplus of £47,566, which is a decline from £64,279.

The result of the adoption of metallic filament lamps by consumers is illustrated in most directions by the figures before us; and it has to be borne in mind that the end of consumption reduction, and the effects on capital expenditure of a lessened return per consumer, are not by any means yet within sight. Examples are: Blackburn reports an increase of only 2 per cent. in their total output of units, owing to the new lamps; Burnley had a decrease of 286,104 units; Croydon (with a decent surplus to be carried forward) reports that metallic filaments were responsible for an estimated revenue loss of £2000; Dover experienced a falling off in the sales to private consumers of 79,636 units; Hampstead announces a drop of £3000 in income; Hull records a drop of nearly £1000 on private lighting; Lancaster states that there was a decline of 4·33 per cent. in the units sold for private lighting, owing to the increased use of metallic filament lamps, and over the whole business the total increase in the units sold was only 0·47 per cent.; Leeds had a reduction of revenue from private lighting amounting to £7842; Manchester has been referred to in the preceding paragraph; Southport in the winter half of the year had a breaking away of 18,631 units for lighting; Sheffield had a decrease in the sale of lighting current by 196,175 units, and it is estimated that of this quantity 113,175 units were due to the use of metallic filaments, with a revenue decline of £4251 from the same cause; Yarmouth reports that the increase in the return from private consumers was only £4! There is no mistaking these figures. They have an imposing significance; and well it is recognized in the electrical industry, although not more than is necessary is publicly said about this aspect of municipal trading.

From the figures quoted in the preceding paragraphs, it is fair to assume that the metallic filament lamp is not serving as the impetus to increased business that the more enthusiastic station engineers had anticipated. Not many of the notices of accounts that have come before us give any indication as to the increase in the number of consumers. But as instances of slow progress, Blackburn states that the new connections last year only totalled 300; Brighton only secured an addition of 250; Gloucester, 43; and West Bromwich, 20. Of course, a difficulty of a no mean order that the electricity undertakings have to contend with is the improved efficiency of inverted incandescent gas-lamps. When a 50-candle power inverted lamp can be obtained that consumes only 2 to 2¼ cubic feet of gas an hour, and which will run from 450 to 500 hours on 1000 cubic feet of gas, such economical lighting is hard to beat. The increases of output of electricity during the year are mostly due to extensions of power supply; but what little effect this has had on the net surpluses of central stations is seen in several directions, typical of which is St. Helens. There a "considerable increase" is reported in the number of units sold for power, but the total income was only £285 more, and the surplus was merely £376. It would be interesting if one could see behind the scenes, and ascertain the experience of undertakings in regard to large consumers severing their connections from the town cables, and adopting private generating plants. St. Pancras reports the loss of several large consumers. The Marylebone Council are offering more seductive terms to prevent considerable consumers from installing private plants. It is also noticed that several undertakings take substantial sums from the ratepayers for electricity supplied for public lighting. But Crewe must surely stand in a peculiar position, with an income of £3799 from current sold by meter, and £3565—only £234 less—as the receipts for public lighting.

Dealing with municipal finance during the past year is a convenient opportunity for referring to a return recently published, supplying some total figures for the year 1907-8 regarding the fifteen electricity undertakings owned by Metropolitan Borough Councils. The net capital expenditure stood at £5,925,009. The number of units sold was 61,931,061. The average price per unit of the fifteen undertakings was 1·71d. for public purposes; for private lighting, 3·43d.; and for power, 1·15d.—the average of the whole per unit being 2·49d. The average cost of production was 1·20d. The gross profit realized—that is to say, before meeting capital charges—was £336,533, or less than 6 per cent. The total number of consumers was 28,846. The capital written off amounted to only £124,207; and, with the net capital expenditure standing at close upon 6 millions, only £30,879 was transferred to the reserve and other funds! This cannot be described as a strong financial position.

The arrangement that the Bath City Council made with Mr. Schenk on behalf of the Somerset Power Company, whereby the municipal undertaking was to be transferred to form the nucleus of the power concern, and in the event of non-performance of the agreement on the part of the Company a deposit of £2500 was to be forfeited, has turned out conveniently for the Council, though it has not relieved them of the concern that has been a sort of white elephant ever since they have had it, and has not paid for the time expended by the civic fathers on its administration. The Company did their very best to bring the scheme to a conclusion; and it was only the refusal of the Board of Trade to sanction the bargain that it fell through. In view of the fact that it was not their fault that there was non-performance, it is rather hard on the Company that the Corporation should have pocketed the deposit, and utilized it in making good accumulated deficits on the undertaking to the amount of £1659. About the costs to which the Council were put over the negotiations, they are fair deductions from the deposit—£283, cost of the negotiations, a vote of £157 to the Town Clerk, and there is still left a little over £100 to the good. It may be suggested that this should be utilized in buying Mr. Schenk some token of the appreciation of the Council, for enabling them thus easily to clear off accumulated deficits.

The Electric Lighting Acts (Amendment) Bill has passed its third reading in the House of Commons; but it goes forward with the entire wiring and fittings clause deleted. The event has shown that, if the local authorities supplying electricity actually wanted powers to carry on the wiring and fittings business without subjecting themselves to attack by the Electrical Contractors' Association for doing something *ultra vires*, they would have done better to accept Lord Avebury's amendment (which made it obligatory upon them to carry on the business through local contractors), than to have got their friends at the Board of Trade to induce the Commons Committee to erase the words which curtailed their freedom. Those who were affected by the reversion to the former position could not be conciliated; and the Board of Trade must have been heartily sick of the storm to which the modified clause gave rise. This was seen when the Bill was up for its third reading; for with nothing more than a murmur of disapproval, the Parliamentary Secretary of the Board accepted the amendment cancelling the whole clause.

## Retirement of Mr. E. C. Riley.

After a service of rather more than twenty-two years in the capacity of Superintendent of the Gas-Works Department of the Great Western Railway at Swindon, Mr. E. C. Riley has retired from the position, in which, it may be remembered, he succeeded Mr. C. E. Botley, who is now Engineer and General Manager of the Hastings and St. Leonards Gas Company. Prior to his appointment, Mr. Riley had been for some years with the Railway Company. During the time he had charge at Swindon, the coal-gas works there and at West London, Worcester, Milford Haven (Neyland), and Didcot were either enlarged or improved; and oil-gas works were built and put into use at London, Swindon, Bristol, Exeter, Worcester, Wolverhampton, Birkenhead, Neyland, and Cardiff, for supplying gas for train lighting and for dining restaurant cars, &c. Many experiments were undertaken in train lighting, with both coal and oil gas, with various types of burners, culminating in the adoption of the "Bijou" inverted burner, consuming 0·65 of a cubic foot of gas per hour, and giving a light of from 20 to 22 candles. Before leaving Swindon, the esteem in which Mr. Riley was held was manifested in the way of presentations made by the staff and workmen of the Gas Department and other friends. He interested himself in the public life of Swindon, and was a Justice of the Peace and a member of the School Board. He has gone to live at Wallasey. We understand that for the future the gas-works will be under the supervision of the Manager of the locomotive works.

M. Rouland, the General Manager of the Paris Gas Company, has been made a Chevalier of the Legion of Honour. He was the founder of the Company formed in 1903 for lighting the suburbs of Paris and has rendered exceptional service in connection with works for the manufacture and supply of gas.

## PERSONAL.

Out of 68 applicants for the position of Gas Engineer and Manager to the Workington Corporation, rendered vacant by the death of Mr. George Keyte, three were selected as being the most suitable; and, as the result of further consideration, the appointment has been conferred on Mr. E. G. HUTCHINSON, the Assistant Manager and Engineer at Stockport.

At a recent meeting of the Chesterfield Water and Gas Board, the Sub-Committee who had considered the question of appointing a General Manager recommended that Mr. J. W. B. SIMPSON, the present Accountant, have the control and management of the commercial department of the gas and water undertakings, and that he be styled Accountant and Commercial Manager.

The staff of the Coventry Corporation Gas Department have just presented Mr. CHARLES MATTHEWS, one of the members, with a silver table centre and cake-stand, on the occasion of his marriage. The presentation was made by Mr. J. A. Noble, the Accountant of the Department, who spoke of the high esteem in which Mr. Matthews was held by the staff, and tendered to him their best wishes for his future happiness and welfare. These sentiments were endorsed by Mr. Fletcher W. Stevenson, the General Manager, who presided, and were suitably responded to by Mr. Matthews.

## SOME GAS EXHIBITS AT OLYMPIA.

IT is difficult to imagine an exhibition—save, perhaps, a purely electrical one—where a display of gas apparatus of one form or another would not be in perfect harmony with its surroundings, inasmuch as gas possesses advantages for practically all purposes under almost any conditions. In a social or industrial exhibition therefore it would be a disappointment to find gas entirely unrepresented. This disappointment, however, will not be experienced by visitors to the "Exhibition of Women's Work in all Spheres" which is now being held at Olympia; for there the domestic uses of gas are well demonstrated. One section of the exhibition is devoted to the work of the National Society of Day Nurseries; and here both a model and a working *crèche* are fitted with gas heating and cooking appliances, which were supplied and fitted by the Gaslight and Coke Company. There is in the working *crèche* a double "Surrey" condensing stove for airing; a large Ewart "Califont" geyser which furnishes an unlimited supply of hot water; a Fletcher "Malta" griller, which is specially adapted for warming food, by the provision of a small burner in the centre of the boiling-ring; and a Richmond cooker. The model rooms are fitted with a Ewart "Lightning" geyser, and three fires—a Main "Worcester," a Richmond "Bavarian," and a Wilson "Sheraton." In another portion of the annexe, the St. Clement's Nursing Institution have model rooms in which the Gaslight and Coke Company have placed a Maughan "New Teba" geyser and a Davis "Gascol" range. Here are to be noticed some paper bags of coke containing 28 lbs. each, priced at 4d. In the office of the Day Nurseries Society an installation of acetylene gas lighting has been fitted up. One of the stalls in the body of the hall is occupied by Messrs. S. Clark and Co., who make a representative display of their "Syphon" stoves; and on another are to be seen Hutchings's steam-cookers, which are eminently suitable for use on gas-stoves.

## AN ENGINEERING DAY

### At the White City.

UNDER the presidency of the Lord Mayor of London (Sir George W. Truscott), an "Engineering Day" was held last Saturday at the Imperial International Exhibition, Shepherd's Bush. It was organized by the General Mechanical Engineering Committee, the Mining and Metallurgical Committee, the Building and Engineering Construction Committee, the Institute of Marine Engineers, and the Cornwall Mining Committee. The arrangements were in the hands of an influential Joint Committee, under the chairmanship of Mr. W. Worby Beaumont; and the Hon. Secretary was Mr. W. Yorath Lewis. The reason advanced for the gathering was that the various Committees of the Engineering Section of the Exhibition felt that those interested in engineering in its great variety of branches seldom have any opportunity of meeting together under circumstances that combine the social and technical advantages of a general congress. Moreover, it was considered that such a congress might be productive of good service in the interest of the engineering community as a whole, inasmuch as there are a large number of Technical Societies serving useful purposes in a somewhat limited field which might be considerably increased if there existed better opportunities of associating with kindred Institutions.

Beyond these general considerations, there was only one item in the day's proceedings of special and particular interest to the gas engineering profession. During the afternoon, there was a series of six lectures and papers read in the Congress Hall; and one of these was by Mr. Percy Allen, on "Large Gas-Engines." The value of this lecture (which was much appreciated by those who were present) was enhanced by a large number of lantern slides. An abstract of it will be found on p. 635. There was a pause in the business proceedings while the Lord Mayor held a reception on the terrace of the Imperial Tower; but there were numerous parties in different parts of the grounds, bent on the work of inspection, who were unable to get back for this ceremony. As, also, the papers read dealt with widely different subjects, the audience was to a considerable extent different for each one. There was thus no opportunity of seeing all the engineering visitors together at one time to form an estimate of the attendance. Certainly, there was a very fair gathering, drawn from the members of a great many different societies; but should the actual numbers prove to be smaller than was anticipated by the organizers it would not be at all surprising, considering the inclement weather that was experienced. In any event, the idea with which the gathering was organized has been approved in many quarters.

There were a number of special demonstrations in the Machinery Hall; and a very popular item of the programme was an inspection of the construction and operating mechanism of the numerous examples of mechanical and structural engineering to be seen in connection with the different "amusement" devices. To a considerable extent, these consist of the hauling of cars, &c., to the top of an incline, and then allowing them to run down in various more or less startling fashions. Probably few of those who undergo the experience of a ride ever give a moment's thought to the motive power employed for raising them in the first instance to the summit; but this was a matter which created considerable interest on Saturday. Of course, the well-known Flip-Flap is electrically operated, as also are a good many of the other "side-shows;" but there are at the same time several cases in which gas-engines are employed. For instance, in the Spiral Railway the cars are pushed up the circular path by means of a chain-driven revolving shaft operated by a 26 H.P. gas-engine. In connection with the Canadian Toboggan and the Wiggle-Woggle the haulage is carried out by continuously running cables to which the cars or tubs are attached as required; gas-engines of 16 H.P. and 20 H.P. respectively being employed for the purpose. All these three engines, it should be mentioned, are by Messrs. Tangye. Then in connection with a model bakery there is a Hornsby-Stockport engine using suction gas, which drives a dynamo; the producer gas being also burnt under the ovens for baking biscuits, &c. For the Scenic Railway, suction gas is used, the cars being elevated by wire ropes; while on the Mountain Railway, the cars themselves are provided with electric motors. The petrol-driven tramcars, which one now has to dodge in the grounds of the Exhibition, hold thirty passengers, travel 8 miles an hour, and are of from 35 H.P. to 40 H.P. While making the tour of inspection, those who kindly acted as guides drew attention to the high-pressure gas lighting plant. The excellence of the illumination given by these lamps in the evening time, both in the Machinery Hall and in a portion of the grounds, was also pointed out.

In the evening, a largely attended banquet took place in the Garden Club. The chair was occupied by the Hon. Arthur Stanley, M.P., who, in proposing the toast of "Engineering," said he thought that those who lived in the present age were much-favoured individuals, because there had been witnessed in the last few years probably the most interesting developments in almost all forms of engineering that the world had ever seen; but the next ten or twenty years might be more eventful even than the last. One often heard that England was falling behind in the race, and that other nations were going ahead; but he thought it could be shown that, at all events in engineering, England, Scotland, and Ireland were not only holding their own, but were doing more than this. Mr. Worby Beaumont, Mr. F. S. Courtney, and Mr. J. W. Orde replied. Mr. Courtney remarked that the field covered by engineers was a very wide one; and so there must be specialization. This was one of the forces in getting the gathering together, because, although there might be two or three large Engineering Societies which claimed to have the profession as it were under their wing, there were fortunately a great number of kindred Societies working independently. He trusted they would continue to work independently, because they would possess more vitality and more originality as long as they had a perfectly independent existence. But this was no reason why there should not be closer intercourse between them all; and it was the idea of bringing together the different Societies and different branches in an informal manner which led the Engineering Committee to institute this gathering, which he thought they would all agree had been a highly successful one. He hoped it was the first of what might prove to be an annual meeting. They were greatly indebted to the Hon. Secretary (Mr. Lewis). Several other toasts were submitted, among them being "Architecture and Building," which was proposed by Sir John Cockburn, who remarked that as time went on building and also architecture became more and more engineering problems.

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Concrete cable conduits have been in use during the past three years in St. Louis, by the Union Electric Light and Power Company. The individual ducts are U-shaped with flat tops, and the moulds consist of 16-feet sections of lumber, dressed to the U-shape, and held down by suitable weights in the duct form supports, which have previously been set to grade and aligned in the bottom of the trench. Concrete is then dumped into the trench, suitably rammed and puddled round the forms, and finally struck off level with the tops of the moulds. After the concrete has set, the moulds are removed by lifting them up and out of the concrete.

# GAS-ENGINE AND ELECTRIC MOTOR FAILURES.

THE annual report of the Chief Engineer of the British Engine, Boiler, and Electrical Insurance Company, Limited (Mr. Michael Longridge, M.A., M.Inst.C.E.), is before us; and it is in its substance of the usual didactic order. In mechanical plant, failures stand for much in giving instruction; and the recounting of the details leading up to them serve as warning to owners and users, and show what to avoid, and what to look for. The section of the report devoted to actual practical experiences in respect of mishaps with internal combustion engines is not so extensive as it has been in former years, owing to Mr. Longridge devoting a considerable part of the available space to the discussion of formulæ for making a close estimate of the stresses upon engine-shafts. This is important in view of the number of breakages of shafts—amounting to 9 per cent. of the total number of gas-engine breakdowns in the year—and to the variety of dimensions adopted by different makers.

Prefacing the parts referring to the failures, it is of interest to note that the rate of increase in the Company's business in the insurance of internal combustion motors has practically reached the same level as that of steam-engines. Four years ago there were 27 steam-engines insured for every 20 gas-engines. In 1907, there were 26 steam-engines for every 20 gas-engines. Now the relation is about on a level. Still Mr. Longridge has no doubt that while small steam-engines have had to give place to gas-engines, gas-engines in their turn have had to make room for electro-motors. But for these, the increase in the number of internal-combustion engines insured would have been greater. The ratios of breakdown of steam and gas engines were in the year approximately equal—viz., 1 in 9·4 and 1 in 9·1, as against 1 in 11·7 and 1 in 11·1 in 1907. The proportions in which the various parts of the insured gas and oil engines broke down in 1908 are given in the last column of the following table:—

| Description of Parts which are Believed to have Given Way First. | Average Previous to 1907. | During | |
|---|---|---|---|
| | | 1907. | 1908. |
| | Per Cent. | Per Cent. | Per Cent. |
| Valves and valve gear | 32·5 | 43·3 | 31·3 |
| Cylinders and cylinder ends | 16·6 | 13·5 | 19·4 |
| Pistons | 11·7 | 2·7 | 4·8 |
| Connecting-rods and their bolts | 11·2 | 8·1 | 10·8 |
| Main shafts | 5·0 | 4·7 | 9·1 |
| Governors and governor gear | 4·4 | 7·4 | 4·8 |
| Silencing-boxes and exhaust-pipes | 4·4 | 1·4 | 2·4 |
| Fly-wheels and driving-drums | 4·3 | 4·7 | 5·4 |
| Clutches and couplings | 3·5 | 0·0 | 0·0 |
| Frames and pedestals | 2·8 | 4·0 | 1·2 |
| Bolts* | 2·6 | 1·4 | 2·4 |
| Total wrecks, cause not ascertained | 1·0 | 0·0 | 0·0 |
| Main driving ropes or belts | 0·0 | 0·0 | 0·0 |
| Miscellaneous | 0·0 | 5·4 | 5·4 |
| Gas-producer plants | 0·0 | 3·4 | 3·0 |
| | 100·0 | 100·0 | 100·0 |

* These bolts do not include bolts in connecting-rods, valve-gear, and other moving parts; the bolts in these parts being included with the parts themselves.

The causes of these breakdowns may be roughly classified:

| | |
|---|---|
| Accident and causes unascertained | 35 per cent. |
| Old defects or deterioration by wear and tear | 20 ,, |
| Weakness, bad design, workmanship, or material | 18 ,, |
| Negligence of owners or attendants | 27 ,, |

In the first table, there is again evidence of weakness in the design and manufacture of valves and valve gear. There is also a considerable increase in the percentage of cracked cylinders and cylinder ends; but this is principally due to the severe frosts at the beginning and end of the year, whereby many jackets left undrained and exposed were cracked. The breakdowns from fracture of connecting-rods and their bolts (in nearly every case the bolts) were also more numerous than in 1907, though below the average; but breakages of crank-shafts were more frequent than in any previous year, except 1906. For this no reason can be given.

Only two examples of gas-engine breakdowns are given; and they are chosen because typical of two of the weak points in gas-engine design—connecting-rod bolts and fly-wheel keys.

The first is the case of a horizontal gas-engine, with cylinder 20 inches diameter by 2 ft. 6 in. stroke, running at 180 revolutions per minute, with producer gas. The big end of the connecting-rod was of the marine type, with round-backed gun-metal steps; the cap being held by two steel bolts, 2 inches diameter, screwed with Whitworth standard threads. There were no fillets at the junctions of the shanks and heads, nor were the shanks reduced in diameter between the heads and the screw-threads. Thus the smallest diameter of each bolt was the core diameter of the thread. The engine was started about the end of August, 1907. Soon afterwards the cylinder end cracked, but was temporarily repaired, and kept at work while a new cylinder was being got ready. This was put in early in 1908; and the engine then ran till the beginning of February, when both the bolts in the big end of the connecting-rod gave way at the junction of the shank to the head. In the one which probably broke first, fracture had evidently commenced some time before the final break, and had extended gradually through the metal; for, with the exception of a small area, the surfaces of the fracture were smooth and black with oil. In the other the break was new, and had probably happened after the first-mentioned bolt had finally given way. Its surfaces were clean and fresh, and composed of large crystals. The cause of the original crack which led to the first failure was probably the sharp corner at the junction of the head and shank. The stress put upon the bolts by the inertia of the moving parts was about 3000 lbs. per square inch. Previous to the breakdown, the engine had made about 11 million revolutions. The damage done was considerable. The cylinder end, piston, and bed-plate were broken beyond repair, the liner was damaged, and the connecting-rod bent. After the breakdown, the bolts in the big end of the connecting-rod of another engine belonging to the same firm, and made the same way, were examined; and an incipient crack was found with the aid of a magnifying glass at the junction of the head and shank of one of them. Probably the majority of the bolts in connecting-rods of the marine type are made without fillets under the heads; but the additional bearing surface gained thereby is not sufficient compensation for the risk involved.

The second example is a horizontal gas-engine, five years old, with cylinder $8\frac{1}{2}$ inches diameter by 51-inch stroke, running at 176 revolutions per minute, with lighting gas from a town main. The engine had one fly-wheel, 5 ft. 6 in. diameter, with six curved arms, and boss $7\frac{3}{8}$ in. diameter by $7\frac{3}{16}$ in. wide, bored to $3\frac{1}{2}$ inches diameter to receive the crank-shaft, to which it was secured by one key, $8\frac{1}{2}$ inches long, $\frac{7}{8}$-inch broad, and $\frac{5}{8}$-inch thick, with a gib head. The depth of the keyway in both shaft and boss was $\frac{1}{16}$ inch. In 1907, the key broke inside the boss $2\frac{3}{4}$ inches from the head end; and both it and the key-bed in the shaft were found battered and slightly worn at the edges. Evidently the wheel had been rocking on the key. The owner of the engine was advised to have the wheel taken off the shaft and the keyways in both machined to true plane surfaces; but he declined to keep the engine standing longer than was necessary to get a new key driven in. The new key was made, and driven up tightly, and a tin shield which covered the end of the shaft and the side of the boss was refixed. The engine ran for nine months, when the wheel became so loose as to attract attention. When the tin shield was removed, the side of the boss which it had covered was seen to be cracked radially from the leading corner of the key-way. The side next the engine was still sound. There was also a longitudinal crack in the shaft parallel to the trailing or driving edge of the key-way. The key was loose, and easily driven out; but the wheel was firmly fixed, and was forced off with difficulty. It was then seen that the crack in the shaft extended the full length of the key-way, parallel to it, and about $\frac{3}{8}$ inch from it, and that the metal between it and the key-way had risen sufficiently to bind the wheel. The fact was that the trailing side of the key—*i.e.*, the driven side—had forced back the face which was driving it and sheared the material that lay immediately behind. The key and key-beds were worn round; and the diameter of that part of the shaft on which the boss of the wheel had been riding was reduced nearly $\frac{1}{32}$ inch, except where the partly-sheared material behind the key, and between it and the crack, had been forced outwards by the pressure of the key. This case is selected for description because the partial shearing of the shaft, the flow of the steel behind the key-way, and the longitudinal crack just about where the plane of the key-bed would cut the circumference of the shaft, differentiate it from the ordinary cases of rocking wheels and consequent split bosses.

With regard to the inspection and insurance of electrical machinery, the business (we learn from the report) again shows a satisfactory increase in the number of insurances; but, alas! also in the number of breakdowns, and in the cost of repairing the damage done. The percentages of increase shown by the figures for 1908 over those for 1907 are:—

| | Dynamos. | Motors. | Starters or Controllers. | Totals. |
|---|---|---|---|---|
| Insurances | 13·8 | 10·8 | 14·3 | 11·4 |
| Breakdowns | 13·0 | 8·2 | 18·2 | 10·7 |
| Cost of damage | 84·8 | 7·7 | 4·0 | 18·3 |

The great increase in cost is, Mr. Longridge thinks, probably temporary rather than chronic; being due to a few expensive breakdowns of large generators. The ratios of breakdown among the various classes of machines were these: Dynamos—Direct current, 1 in 13·7; alternating current, 1 in 5·7. Motors—Direct current, 1 in 9·2; alternating current, 1 in 11·3. Starters and controllers, 1 in 24.

As motors form by far the largest proportion of the machines insured, the proportions in which the parts caused or initiated breakdown in 1908 are tabulated separately, thus:

| Description of Part which is Believed to have Failed First. | Direct Current Motor. | Alternating Current Motor. |
|---|---|---|
| | Per Cent. | Per Cent. |
| Rotating parts carrying current— | | |
| Armatures or rotors | 38 | 21 |
| Commutators or slip rings | 29 | 2 |
| Stationary parts carrying current— | | |
| Magnet or stator coils | 11 | 53 |
| Brush gear and terminals | 6 | 0 |
| | 84 | 76 |
| Rotating parts not carrying current— | | |
| Shafts, spiders, cores, binders, pulleys, gear-wheels, &c. | 9 | 6 |
| Stationary parts not carrying current— | | |
| Frames, pole pieces, bearings, &c. | 7 | 18 |
| | 100 | 100 |

The causes of the year's breakdowns were in all probability the following:—

| — | Dynamos. | | Motors. | | Starters. | |
|---|---|---|---|---|---|---|
| | 1907. | 1908. | 1907. | 1908. | 1907. | 1908. |
| Accidental . . . . per cent. | 8 | 6 | 4 | 4 | 9 | 8 |
| Dirt and neglect. . . ,, | 25 | 23 | 28 | 30 | 16 | 17 |
| Age and deterioration . ,, | 23 | 25 | 23 | 20 | 27 | 25 |
| Bad work or design . . ,, | 21 | 20 | 18 | 11 | 8 | 9 |
| Overloading . . . . ,, | 0 | 0 | 1 | 1 | 5 | 2 |
| Unascertained . . . ,, | 23 | 26 | 26 | 34 | 35 | 39 |
| | 100 | 100 | 100 | 100 | 100 | 100 |

A few of the breakdowns attributed to each of these causes are described in the report to illustrate the kind of cases that the Company have to deal with every day—frequently at the rate of one per hour.

## ZURICH GAS UNDERTAKING.

### Past Year's Working—Vertical and Inclined Retorts.

We have received, through the courtesy of Herr Weiss, the Engineer of the Zurich Corporation gas undertaking, a copy of the report for the past year, from which we have abstracted the following information of especial interest to "JOURNAL" readers.

The constructional work in hand was brought to a close in the course of the year. The coke breaking and sorting plant was completed on a larger scale than had been originally intended, in consequence of the experience gained in the preceding winter. A special screening plant of a capacity of 20 tons per hour was erected for dealing with the coke from the vertical retorts. A new pump was installed for removing the underground and sewer water during the periods when the River Limmat is in flood. The experimental gas-works were brought into use in the spring; and in the course of the year a number of investigations were carried out, not only for the purposes of the Zurich undertaking, but also in some cases for the information of other gas undertakings using vertical retorts. The distributing system was considerably extended during the year.

A statement is given of the number of days during which the various benches of inclined and vertical retorts were in action. As illustrating the durability of the Coze settings of nine inclined retorts, it may be mentioned that the renewal of these retorts was undertaken in the case of one bench after they had been in action for 1538 days, and in the case of another bench after 1974 working days. There are two benches, each containing five beds of ten vertical retorts on the Dessau system. The use of these retorts has had the effect of raising the average make of gas per ton of coal carbonized from 10,891 cubic feet in 1907 to 12,079 cubic feet in 1908. The following tabular statement of the comparative working figures for the inclined retort-settings in No. 2 retort-house and for the vertical retort-settings in No. 2 retort-house shows the relative advantage of the vertical system at Zurich:—

TABLE I.

| 1908. | Metric Tons Carbonized. | | Make of Gas per English Ton. | Weight of Retort Charge. | Weight Carbonized per Retort per Diem. |
|---|---|---|---|---|---|
| | Coal. | Cannel. | Cubic Feet. | Lbs. | Lbs. |
| Inclined retorts . | 43,140 | 1005 | 10,945 | 428 | 2007 |
| Vertical retorts . | 41,554 | .. | 13,281 | 1081 | 2551 |

The larger make of gas from the vertical retorts is, of course, mainly due to the production of water-gas therein; but the effect has been to greatly economize the consumption of coal, which, notwithstanding an increase in the make of 9·2 per cent., has fallen from 85,640 metric tons in 1907 to 84,694 metric tons of common coal in 1908. The consumption of cannel has similarly fallen from 1384 to 1005 metric tons. In the table, the figures in the last two columns are averages, exclusive of the retorts out of action for scurfing. There was a slight reduction in the cost of coal delivered to the works as compared with the previous year. In 1908, the coal cost, including all charges up to the retort-benches, about 28s. 6d. per ton. The vertical retorts also effected great economy in labour, since the number of shifts of men was reduced from 16,235 to 11,998, notwithstanding an increased make of 9·2 per cent. The make per shift was increased from 57,456 cubic feet in 1907 to 84,900 cubic feet in 1908. Taking the two classes of retort-settings, the make per shift averaged 53,069 cubic feet for the inclined retorts, and 178,777 cubic feet for the vertical retorts. The wages paid per 1000 cubic feet of gas made fell from 1·85d. in 1907 to 1·77d. in 1908.

The gas sold to private consumers showed an increase of 10·58 per cent. over that for the preceding year. The unaccounted-for gas fell from 4·89 to 4·64 per cent. of the make. The gas sold for cooking and heating purposes to private consumers amounted to 57·77 per cent. of the make, compared with 55·84 per cent. in 1907. The total make of gas in the year amounted to 28,843,500 cubic metres (about 1,018,637,050 cubic feet). The outlying communities supplied from the Zurich works took 3·90 per cent. of the gas made. The consumption of gas in Zurich itself, exclusive of public lighting, amounted to 4686 cubic feet per head of the population, which is a considerable advance on the consumption per head in previous years. The coke used for heating the retorts was 19·85 per cent. of the coke made. The consumption of coke in the vertical retort-settings, in percentages of the weight of coal carbonized, amounted to 13·9 when no steam was introduced into the retorts, and to 15·0 when steam was admitted. Having regard to the introduction of vertical retorts during the year 1908, the following statement of the average yields of bye-products, in percentages of the weight of coal carbonized, for the past three years may be of interest.

TABLE II.

| — | 1908. | 1907. | 1906. |
|---|---|---|---|
| Coke . . . . . | 72·948 | 70·106 | 73·367 |
| Real ammonia . . . . . | 0·2279 | 0·2063 | 0·1975 |
| Tar . . . . . | 6·044 | 6·260 | 6·318 |
| Thick tar (pitch) . . . . | 0·308 | 0·237 | 0·366 |
| Producer clinker . . . . | 3·410 | 4·150 | 3·680 |
| Retort-scurf . . . . . | 0·071 | 0·060 | 0·093 |
| Prussian blue . . . . . | 0·067 | 0·1155 | 0·0829 |

On the whole, the prices obtained for bye-products were lower than in the previous year, though prussian blue and retort-scurf realized rather better figures. The work done by the laboratory staff included the control of the heats of the vertical retort-settings. They were controlled in a threefold manner: (1) By keeping the draught constant, at about 4-10ths of an inch at the outlet of the setting; (2) regulating the position of the primary-air valve throughout, so that just a feeble blue point, indicating the presence of carbon monoxide, was perceptible after the regenerator; and (3) taking the temperature of the setting once or twice a week with a Wanner pyrometer. The maximum temperature at the bottom sight-hole should be 1375° C.

The gas made was, as in the previous year, washed with anthracene oil for the extraction of naphthalene. The consumption of oil was, however, reduced to nearly half that of 1907, owing to the gas from the vertical retorts being relatively free from naphthalene. The sludge from the cyanogen washers showed a considerably lower average yield of prussian blue from the gas, due to the lower proportion of cyanogen in the gas made from the vertical retorts. The yield of prussian blue fell from 1674 grains per 1000 cubic feet in 1907 to 791 grains in 1908. The purifiers were charged only with Giulini purifying material, which had been found to act more rapidly, and to have a longer life than ordinary oxide. This material contained on the average 45 per cent. of moisture and 67 per cent. of ferric hydrate reckoned on the dried material. The spent material contained on the average 6·1 per cent. of moisture, 65·2 per cent. of crude sulphur, 2·1 per cent. of prussian blue, and 0·35 per cent. of ammonia. This compares with 44·9 per cent. of crude sulphur in a Dutch oxide. Great care has to be used, however, with the Giulini material, in order to avoid ignition during revivification. A purifier charged with it remained in action for eight months, dealing with upwards of 350 million cubic feet of gas. It had to be put out of action on account of the high pressure which it began to throw, and not because the purification was faulty.

Carbonizing tests were made in the experimental plant on 29 German and 15 English coals for the use of the Zurich Gas-Works; and on 33 German, 26 English, and 15 coals of unknown origin for other gas-works. It was found that the coke from the vertical retorts was considerably less porous than that from other retorts. The specific gravity of the former coke was 1·88, and the weight of unit volume, 0·448; whereas the specific gravity of the coke from the inclined retorts was 1·83, and the weight of unit volume 0·363.

The net profit on the year's working was 1,183,828 frs. (£47,353), which is 182,583 frs., or £7303, more than the profit for the preceding year.

**Removal of Naphthalene from Illuminating Gas.**—In a recent number of the "Journal für Gasbeleuchtung," the subject of the determination of naphthalene in illuminating gas, and its removal by cooling, was dealt with by Herr J. Rutten. According to an abstract in the "Journal of the Society of Chemical Industry," naphthalene in illuminating gas may be determined by a modification of Colman and Smith's method, in which the solution of picric acid used is saturated, and contains crystals of the acid. When lighting gas is passed through this solution, the formation of the insoluble naphthalene picrate is quantitative without further treatment; and after diluting the solution and redissolving the picric acid, the solution may be titrated immediately. The removal of naphthalene by washing the gas with tar is the more effective the lower the temperatures of the gas and tar, since the vapour pressure of naphthalene decreases with temperature more rapidly than its solubility in tar. In the author's tests, the gas was cooled by means of chambers separated from the retorts by about 720 feet of pipe. With the inlet and outlet temperatures of one of the coolers varying from 51° C. and 22° C. to 63° C. and 41° C. respectively, the quantity of naphthalene in the gas entering and leaving the cooler varied from 1·142 and 0·564 grammes to 1·950 and 1·44 grammes per cubic metre. It was also found that 50 per cent. of the tar and 70 per cent. of the naphthalene were removed in the cooling chambers.

# PRE-HEATING AIR SUPPLY TO BUNSEN BURNERS

By H. James Yates, F.C.S., of Birmingham.

I have been very much interested in the statements which have recently appeared, both in the "Journal" and also in connection with manufacturers' advertising matter, in regard to the percentage of gas which can be saved, particularly in gas cooking-ovens, by pre-heating the air which is supplied to the bunsen burners. We have just completed some searching tests in our laboratories in respect to one apparatus of this kind which has lately been brought prominently before the public notice, the results of which I believe will prove of interest.

I was convinced, as the result of our previous work and experiments in this direction, that the statements to which I have referred were excessive. I did not, however, anticipate that these were so wide of the mark as they have proved to be by our tests, which are set forth in the following figures:—

| | Oven as Sent out by Makers Arranged for Pre-Heating Air Supply to Bunsens. | | Ordinary Gas Cooking-Oven with no Pre-Heating Arrangement. | |
|---|---|---|---|---|
| | Deg. C. | | Deg. C. | |
| Mean temperature— | | | | |
| At top of oven | 246·4 | | 249 7 | |
| At bottom of oven | 230 6 | | 282·2 | |
| Of escaping products of combustion at flue | 117·0 | | 161·4 | |
| Between walls of oven where air is pre-heated for supply to bunsen burners, right-hand side | 162·2 | | — | |
| Do., left-hand side | 153·0 | | — | |
| Of outside walls of oven, right-hand side | 74·4 | Mean 77·9 | 55·6 | Mean 57·5 |
| Do., left-hand side | 81·4 | | 59·4 | |

During the whole continuance of our experiments, the calorific value of the gas was taken from time to time, and averaged. From the figures thus obtained under readings (after correction to 0° C. and 760 mm.), the number of B.Th.U. used per hour was calculated. The burners of the oven supplied with pre-heated air were left as sent out by the makers; but in the case of the oven which we used for the comparative tests, they were adjusted so as to consume exactly the same amount of gas per cubic foot of oven space as the oven with pre-heated air.

In theory, and under particular conditions, the pre-heating of air for the supply of oven-burners is not without a certain advantage. But, unfortunately, it is not practicable on a commercial basis to construct cooking-ovens and similar low-temperature apparatus with that degree of refined exactitude which is absolutely necessary to attain the desired effect; and, therefore, any increase of value gained in this way is necessarily too small to be of much practical use.

Referring to the foregoing figures, it will be noticed that though the mean temperature of the interior of the ordinary oven was 50° C. higher than that of the pre-heated oven, the temperature of its outer surface was 20° C. lower. This means that with the pre-heated oven there is considerable loss of heat. This fact, which may at first sight seem difficult to account for in face of the economy intended to be effected by the pre-heating, is less difficult of explanation after allowance is made for the unavoidable admission of extraneous air which is not pre-heated, and when there is taken into account the much greater loss in radiation on account of the higher temperature of the outside walls of the oven, which has no non-conducting jacket beyond the pre-heated air that is on its way to the burners. This increased loss in radiation was a result quite to be looked for, having regard to the fact that the air-jacket is not a sufficiently good non-conductor, and allows heat to pass through it to the outer walls of the oven. From there it is lost by two means—convection and radiation. The loss by convection is considerably more in the pre-heated oven than it was in the ordinary oven; for while both ovens were continuously heating the air immediately in contact with their outer walls, the pre-heated oven, on account of the higher temperature of its outer walls (owing to the absence of the slag-wool jacket), was raising this outer air to a temperature anything up to 20° C. more than was done by the ordinary jacketed cooker. The difference between the respective losses by radiation—such as these losses are—is, of course, very much greater than that between the respective losses by convection; being, in fact, proportional to the difference between the fourth powers of the absolute temperatures.

These tests confirm the view that any small initial gain from pre-heating the air for the cooking-oven burners is more than neutralized by the loss in other directions.

**Durability of Cast-Iron Mains.**—In an article on the rusting of iron, with special reference to the corrosion of the Rochester (N.J.) steel conduit, in the current number of "Engineering," emphasis is laid on the great durability of cast-iron mains. It is stated that M. Cavallier, of the Pont-à-Mousson foundries, has recently compiled some interesting records which testify to this. Some flanged pipes, taken up in Paris a few years ago, and bearing the mark "Creusot, l'an 10" (*i.e.*, 1802), were found still in serviceable condition. Some of the 20-inch mains for the Versailles fountains, laid between 1668 and 1688, are still doing duty, only the flange-bolts having required repairs. Clermond-Ferrand is served by water-mains laid down in 1748.

# OBSERVATIONS AND ADVICE ON SHOP LIGHTING.

[Communicated.]

No customer cares to enter a dim or dark shop. He likes brightness, and wants to see what he is buying; and he frequently thinks that poor illumination means poverty of stock. The lighting of a shop helps either to make or mar a business. Good and effective illumination, attracting attention, acts as an excellent advertisement; and its absence may mean the loss of possible customers. A well-lighted shop is usually noted for cleanliness; dirt and untidiness are too easily seen to allow assistants to get slovenly. Brightness, cleanliness, and smartness are consequently the direct results of effective lighting; and they all have a useful, though perhaps insensible, effect upon the customers, to the advantage of the tradesman.

While good illumination is a necessity, inoffensive illumination is not less so. The lighting should not be obtrusive; for glaring illuminants are a mistake. Visits are repeated where shopping is done comfortably. It is annoying to a customer to examine an article with a brilliant light shining directly or being reflected into his eyes, forcing the article to be held first one way and then the other in order to avoid glare. Customers are thus conscious of discomfort, and get little pleasure from their shopping. The problem of the progressive tradesman, therefore, is to satisfy his customers' unspoken requirements, as well as to light his business premises adequately, and yet, in view of the stress of competition, to keep his expenses within reasonable limits. A few hints on intensity, character, and method of illumination may help in its solution.

Generally speaking, in the selection of lamps attention should be paid to their size compared with that of the shop or room in which they are to be used. A sense of proportion is always pleasing. Large and powerful lamps are suitable for spacious shops, but look ridiculous and are unnecessary in small places. Light-sources should be carefully distributed, so that the illumination may be uniform; thus simulating the evenness of diffused daylight. Patchiness of illumination should be avoided, for relative light and shade do not look well in a place of business. Where extra light is specially wanted, it can be added by using a rather more powerful burner or cluster of burners at the point required.

Care should be taken that the lights are not too strong or too prominently placed, otherwise the eyes are uncomfortably dazzled. Much, of course, depends upon the purpose to be served; but effective shop lighting can be done by means of pendants either of a single burner or a cluster of burners symmetrically arranged according to the size and shape of the place and the nature of the business. A good example of this was given in an article on "Shop and Window Lighting" in the "Journal" for Feb. 25, 1908. Either vertical or inverted burners, as desired, may be used in this way. This method of lighting is not expensive. If a cluster of (say) three "C" incandescent burners is employed, a light of about 180-candle power will be obtained for just over ½d. per hour, assuming the price of gas is 2s. 6d. per 1000 cubic feet. In the case of the equally suitable inverted burners, the cost is, if anything, even less. The conditions of the shop may be such as to render large units of light advisable. There are on the market many high-power lamps which, being on the self-intensifying system of gas lighting, give much greater candle power with an improved duty per cubic foot of gas consumed.

A useful rule as to the quantity of illumination required for shops has been given by Mr. F. W. Goodenough, the Chief Inspector of the Gaslight and Coke Company. It allows 30 to 50 candle power for every 1000 cubic feet content of shop; the exact amount varying according to the colour of the ceiling, walls, goods, and general surroundings. The same authority advises that lights should be spaced about one-and-a-half to twice their height from the floor level. For instance, if lights are 7 feet high, the spacing should be from 10 to 14 feet.

In deciding upon the general character of illumination, the following points are worth bearing in mind. The brightness of the light should vary to some extent with the nature of the merchandise. Dark heavy goods—such, for instance, as men's clothing, leather articles, furniture, &c.—require very strong illumination; white or light-looking articles, on the other hand, do not need too intense a light. In the same way, if a shop has several departments, the lighting of the darker rooms, or rooms containing dark-coloured goods, should be much greater than that of light rooms. Otherwise, if the actual illumination is equal, the customers, in going from light-coloured goods or rooms, will feel comparative gloom, and therefore be somewhat chilled when entering the departments where there are heavy-looking or dark-coloured articles.

With reference to shop windows, it may be said that without them and their contents the shop might as well be shut up. The window is so potent an advertisement, that an effective display—and this can only be achieved under the best light conditions—is of the highest importance to the proprietor. In many cases shopkeepers now prefer to leave their windows exposed and lighted long after the shop is closed; and it can be quite understood that it answers their purpose to do so. Good window illumination is, therefore, particularly advisable; and, since it may be required for long hours, economy is of considerable consequence.

In the article referred to, illustrations were given showing

how really good window lighting might be economically obtained. In the first case, a row of twelve inverted gas-burners were suspended near the top of the window. They were equipped with reflecting shades throwing the light downwards and well back into the window. The lamps were practically out of sight, and consequently did not try the eyes. The burners gave a splendid light with a total gas consumption per hour of 36 cubic feet, costing about 1d. Inverted burners are admirably adapted to window illumination because of their brilliancy, the downward direction of the light, and the ease with which they can be applied to existing conditions. In another case, the "deck," or window ceiling, lighting shown permitted of the window being sealed; and as the "deck" was transparent or translucent, the light from inverted burners could be well and evenly distributed. The lamps in this example consisted of inverted burners with mirror glass reflectors. There was no heat in the window itself. Practically anything can be shown in this way. All these lights can be operated by means of pilot jets and a switch.

It should be noted that in the lighting of windows it is always best to have the lamps as far as possible out of the direct line of the eyes. Studding the sides and back of a window with lamps distracts attention from the goods exhibited. If side lamps are used, they should be provided with reflector shields, which will also serve the purpose of directing the light on to the goods. In some cases, such as china and ironware, the lighting can be supplemented, if required, by several shaded footlights.

Where window dressing does not allow of inside lighting, outside reflector lamps can be adopted with advantage. Wind-proof lamps are obtainable which will adequately light the windows at the low cost of from ¼d. to ⅜d. per hour for each lamp. A rule of 50 to 100 candle power per foot frontage, according to the kind of shop, has been given; and it affords very good and effective external lighting.

It was once felt that to adopt electric lighting, irrespective of cost, was to be progressive; but this is no longer the case. Many tradesmen have reverted to incandescent gas lighting, not merely because it is cheapest, but because it is most effective in getting really good illumination. That it is the cheapest is well known; and case after case has occurred where the money previously paid in electric lighting bills has been more than sufficient to reinstate gas fittings and lamps, pay the quarter's bill, and leave a balance in hand.

The effectiveness of gas illumination can be readily observed by anyone who chooses to look at a shop properly lighted by incandescent gas-burners. But there are other advantages. With most businesses it is advisable to keep the door open, ready for customers. In these cases the comfortable warmth resulting from the use of incandescent gas-burners is welcome both to the public and the assistants. In the days of the now almost obsolete flat-flame burners, the heat was probably too great; but with the incandescent gas lighting system this is very materially reduced—leaving, however, just sufficient to give a cosy feeling to the place. Further, this heat prevents materials from becoming damp, labels from losing their adhesiveness, and other similar troubles. On damp and foggy days, the advantage of gas lighting is undoubted. This is proved by the fact that even electric light users fall back upon otherwise disused gas-burners (where they have not been removed) for the purpose of dispelling the uncomfortable cold air.

The old arguments as to the hygienic advantages of electricity are of little account. Gas, as a matter of fact, is a considerable help to ventilation; keeping the air moving upwards, and thus renewing the supply. The use, too, of improved gas-lamps and inverted burners practically avoids any effect on ceilings and the like in ordinary places of business. The possibility also of easily switching lights on and off from one or more given points now applies to gas-fittings.

The public generally do not sufficiently realize the fact that where they have a gas supply they also have an expert and competent guide to good lighting results in the manager of the gas undertaking from whom they buy their gas. Nowadays all gas companies lay themselves out to afford advice and help to their customers gratuitously; and there need be no hesitation in accepting such free assistance. The gas officials are in a better position to advise, because the whole of their study and work is in gas matters, and their attention is not distracted by the vast variety of things dealt with by the ordinary ironmonger. Advice can thus be easily obtained as to adequate gas supply and pressure, reliable gas fittings and burners, how to instal them, and subsequently the best way of maintaining efficient results. Efficiency can be obtained by anyone, since incandescent gas-burners do not require skilled, but only simply common-sense, attention. It is a good plan to give the work of burner maintenance to one member of a staff. The cleaning of burners and the care of mantles do not take much time, and are quite as necessary as the ordinary dusting and sweeping of a shop. If any alteration or improvement in the lighting of a shop or other premises is contemplated, the proprietor, before doing anything, should consult the local gas manager.

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At a meeting of the Longton Town Council, sitting as the General Purposes Committee, on Monday of last week, it was decided, in response to an application, to increase by £50 per annum the salary of Mr. William Langford, the Gas and Electricity Engineer.

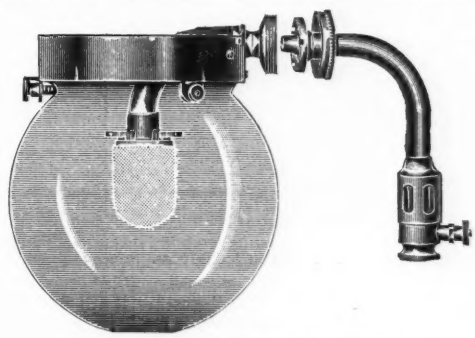
## SOME NEW GAS-FITTINGS

### Of Messrs. Falk, Stadelmann, and Co.

We are now at the season of the year when those manufacturers who lay themselves out to meet the requirements of the suppliers and consumers of gas for the purposes of illumination are wont to introduce to public notice such fresh appliances as may have been devised by them for the benefit of their customers—and themselves. Perhaps the last two words are hardly necessary, for no one would expect a manufacturing firm to go to the trouble of placing upon the market any goods which they did not anticipate would be of benefit to themselves as well as to their customers; and, further, it is only in the natural order of things that what is of assistance to the buyer should also be the same to the seller. This, however, is a digression; and we must descend (or ascend) from the general to the particular.

A visit to the extensive show-rooms of Messrs. Falk, Stadelmann, and Co., in Farringdon Road, affords further proof of the demand that is anticipated for an intermediate size inverted burner. The firm are now making a "Vindex-Medium" burner—a new intermediate size between the large and bijou burners. It is strongly made in polished brass, steel or red bronzed, or oxidized copper, and has a china deflector. In outline and finish, it is like the large size "Vindex;" and it is specially suited for domestic lighting by reason of its small gas consumption—2¼ cubic feet of gas per hour, which is stated to give 55-candle power. The burner, which has a neat appearance, is fitted with a superior gas-regulator, having a thumbscrew of non-heating material, and an air-regulator. A new large size burner is the "Luna," which is similar in form to the firm's well-known "Vesta-Veritas," but of lighter and cheaper make. This has a china or enamelled casing, and is fitted with gas and air regulator; while it can be had with or without a bye-pass. It is claimed that with it a lighting power of 110 candles can be obtained for a consumption of less than 4 cubic feet of gas per hour. These burners, it may be remarked, are British made throughout.

The "Vindex-Medium" Burner.



"Veritas-Reversible" Swan-Neck Burner.

There are two other lines which Messrs. Falk, Stadelmann are introducing that may also be mentioned. The first is the "Veritas-Reversible" swan-neck burner, in strong polished brass. This is provided with a union joint, enabling it to be used in four different positions, so as to make it available for different types of brackets or pendants. The illustration shows it in use for adapting an inverted light to an upright fitting. The burner is said to give a light of 65 candles with a consumption of gas of about 3 cubic feet per hour; and it is provided with a gas and air regulator. Fitted to it is the other speciality of the firm to which attention has to be drawn. This is a new patent spring globe holder, the object of which is to facilitate the fitting of globes to, and their removal from, the burner, as well as to allow of the free expansion of the glass, and thus minimize risk of breakage. Spring pins are used instead of the ordinary screws; and these pins are fitted with tongues which, on turning the pins when they are drawn back, hold them in position at tension while the globe is being fitted. On turning again, when it is desired to fix the globe, the tongue passes through an aperture in the gallery provided for it, thus releasing the pin, which immediately springs into position for holding the globe. These holders can, of course, also be had fitted to other burners.

In addition to the lines here referred to, the firm have lately issued an incandescent gas lighting catalogue of a very complete kind, in which other new goods are illustrated and described. For instance, upright and inverted mantles, including the "Veritas Trilux" quality of inverted mantles and the "Merlin" self-shaping mantles, and also upright and inverted mantles and burners for petrol air gas. Among other things, many handsome designs in plain and fancy glassware are illustrated.

# NEW GAS-FIRES FOR THE APPROACHING SEASON.

### Messrs. John Wright and Co.'s Novelties.

We are again reminded that autumn is with us by an early intimation from Messrs. John Wright and Co. of their preparations for the forthcoming gas-stove season. It is claimed by the firm that their new appliances embody further fresh developments in gas-heating, particularly in an increase of radiant efficiency. An innovation which cannot fail to be of great interest, and which was foreshadowed last year in the firm's patent "N.V.," is the large increase of fire width introduced in their latest pattern fires. This is a matter to which Messrs. Wright attach very great importance. They hold that one thing which has hitherto retarded the more general adoption of heating by gas has been the fact that when a coal fire of (say) 16 to 20 inches has had to be replaced by a gas-stove, the best that could be done was to put in a gas-fire some 10 inches in width at the most. As a result, the new appliance not only looked disappointingly small, after its much wider predecessor, but actually afforded so much less radiating surface that, in spite of its many advantages, it often did not adequately heat the room in really cold weather.

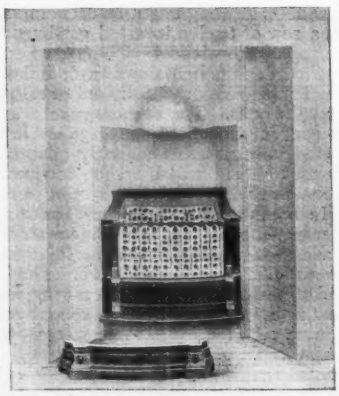
The introduction of this new wide-fire principle makes available in the gas-fire as great an amount of radiating surface as in the coal-fire which it replaces. Some two or three years ago, such a departure as the principle referred to involves would not have been possible. Messrs. Wright point out that it is their successive inventions—the "Simplex" shallow fire, and later on the patent "Thermo" fire-front—which, by rendering every heat unit of the gas consumed directly effective as radiant heat, have made the gas-fire so much more economical as to bring the construction of a stove of so great a width as 20 inches within the sphere of practical attainment. With the old deep type of gas-fire, the cost of gas for a stove with such a fire-width would have been quite prohibitive; but with the economies effected by the "Simplex" and the "Thermo" principles, it is claimed that Messrs. Wright's new "Salon" gas-fire, which embodies this new wide-fire principle, has an astonishingly low gas consumption, notwithstanding its unprecedented width and its proportional increase

**The "Salon" Gas-Fire.**

in radiant efficiency. The "Salon" gas-fire, it will thus be seen, is an entirely new type of stove. It is made in two sizes, with fire-widths 17 and 21 inches respectively, which it is submitted provides an amount of radiating surface beyond anything hitherto attempted. Messrs. Wright's experience with last year's patent "N.V." stove, 36 inches high, has so far confirmed their anticipations of the welcome which would be accorded to it, that they have this year produced a series of these fires by adding two new heights, 31 and 34 inches respectively; and as each fire can be had with wings open at the back 20, 22, 24, and 28 inches, this actually forms a range of twelve separate fires.

**A Group of "N.V." Patent Stoves.**

The "Hotspur" basket fire is designed to give a new lease of life to the old-fashioned form of "basket" fire, by bringing it into line with modern gas-fire science. A feature of much importance is its patent adjustable grate-front, which hides the ash pan opening of the coal-grate, and can be fixed by a couple of screw-knobs at any height from 3½ to 5½ inches, so as to make a continuous grate-front with the ordinary fender of the basket-fire itself. It is claimed that the effect is so far in advance of the ordinary pattern that the "Hotspur" may with confidence be expected to create a considerable demand for this type of fire. It is made in four sizes, with "Thermo" fire-front in four widths—8, 10, 12, and 14 inches respectively.



**The Patent "Hotspur" Basket-Fire in Coal Grate.**
(Showing the patent adjustable grate-front separate from the stove.)

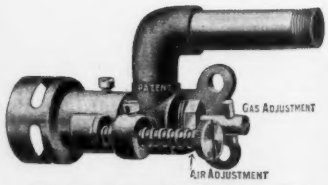
**The "Official" Flue Radiator.**

Another apparatus on which Messrs. Wright lay much stress, and for which they are hoping great things, is the "Official" flue radiator, specially designed for use in ill-ventilated or closely-crowded workshops, offices, &c., where it would be inadvisable to instal a flueless gas-radiator. It may therefore be regarded as the natural complement of the firm's "St. Andrew;" and as the principle of the new radiator has been well tried for many years in their "St. Patrick" with flue, Messrs. Wright speak very confidently of the position which they believe the "Official" is bound to make for itself, in greatly widening the limits within which gas radiators may be effectively employed.

A further improvement is embodied in their new (1909) patent "Simplex" gas-and-air adjuster, which provides for perfectly graduated adjustment all the way between the minimum and maximum limits, while securing equally unimpeded pressure at all points. As there are no screw-threads employed, in adjusting the gas, there can be no possibility of leakage.

Messrs. Wright have added to their already large selection of nursery fires yet another—the "Forum"—which is noteworthy for its beauty of design and its very moderate price.

**The "Forum" Gas-Stove.**




**The (1909) Patent "Simplex" Gas and Air Adjuster.**

In addition to these various new appliances, the firm have invented a contrivance by which the gas on its way to the burner is raised to a very high temperature, with a consequent increase of radiant heat. This contrivance can be fitted to the "Salon" and patent "N.V." gas-fires at small extra charge.

It is among the most hopeful signs of the times in connection with the gas industry that year after year should see successive lists of fresh inventions all tending to develop its great unused resources as regards consumption; and one cannot but wish that success may attend the efforts of all who continue to strive for the perfection of the gas-stove on scientific lines.

# STANFORD-LE-HOPE GAS-WORKS.

**Opening Ceremony.**

**A View of the New Gas-Works.**

REFERENCE was made in the "JOURNAL" some weeks ago to a moderately capitalized undertaking entitled the Stanford-le-Hope Gas Company, Limited, which had been formed for the purpose of erecting works at the place named; and it was remarked that this was "quoted as an example of an honest gas investment, as distinguished from company promoters' over-capitalized concerns." We stated that the Directors were men bearing such well-known names as Mr. W. A. Surridge (Chairman), Mr. James Cloudsley, J.P., and Mr. Frederick R. Smith; while the Secretary was Mr. William Cash, F.C.A., and the Board were being advised, in the capacity of Consulting Engineers, by Messrs. Corbet Woodall and Son. The Company have a Provisional Order dated 1905; but nothing was done with it until last year, when a start was made with the erection of the works, which were formally opened last Wednesday, when the supply of gas to the district commenced. The statutory powers include the supply of gas in the parishes of Mucking, Orsett, Horndon, Stanford, Corringham, Fobbing, and Langdon Hills, in the county of Essex. The oil street-lamps of Stanford-le-Hope have been usually lit on Sept. 1, following a summer vacation; and the new Gas Company, having contracted with the Parish Council, were able to celebrate their opening by lighting 80 of these with incandescent gas—Bray's upright burners being utilized for the purpose. The district is first and foremost an agricultural one; but it has a growing residential population, and there are some factories in the neighbourhood. Its frontage on the River Thames, too, should be a point in its favour. In addition to the street-lamps, the Company start with about 100 consumers.

The works, which stand on about ¾ of an acre of ground, have been designed for an output of 5 million cubic feet a year, though this consumption is not anticipated just at first. It is, however, thought that half this quantity will be required at the outset. The site borders on the railway, which will facilitate the delivery of coal; and later on, if thought desirable, it will be easy to run a siding into the retort-house. The works have been substantially and well built of brick by Mr. J. Dobson, a local Contractor. The first range of buildings comprises the office, stores and workshop, and station-governor room. Then comes the retort-house (covering a space of about 30 feet by 36 feet), adjoining which is the exhauster-house. After the purifiers are the oxide-shed and the station-meter house; and at the end of the site is the holder.

There are two retort-benches, one with one and the other with two retorts, fired on the regenerative principle, by Messrs. Gibbons Bros.; and at the side is a Dillamore tar-column. There is plenty of room for extensions when required, both in this and in other parts of the works. After leaving the retorts, the gas passes round the inside of the house, and through a set of tubular condensers. The exhauster, gas-engine, and pump are by the Bryan Donkin Company; and there is a Livesey washer, by Messrs. Bailey, Pegg, and Co. The purification will be by oxide of iron. The station-meter (of 1200 cubic feet per hour capacity) and the governor are by Messrs. Parkinson and W. & B. Cowan. It is proposed to supply the gas at about 2½ inches pressure; and the initial price will be 4s. 6d. per 1000 cubic feet. The gasholder, constructed by Messrs. S. Cutler and Sons, of Millwall, to the designs of the Engineers, is in two lifts, and has a delivering capacity of 14,500 cubic feet. It is contained in a steel tank 32 feet in diameter by 12 ft. 4 in. deep, and is spirally guided by five rail guides and carriages to each lift, constructed in accordance with Messrs. Cutler's patents. The tank has a capacity of 60,000 gallons of water, or 268 tons. The dimensions of the two lifts are as follows: Outer lift, 30 feet diameter, and 12 feet deep; inner lift, 28 feet diameter, and 12 feet deep.

The most interesting feature of the undertaking is the exclusive use of Mannesmann steel tubes for distribution. There are at present about 5 miles of mains, ranging from 6-inch to 2-inch, with the "rigid" type of joint, and caulked with lead wool. The

**Testing with Pump and Mercury Gauge.**

**Group of Specials, with Rigid Joints.**

A Straight Run of Mannesmann Tubes.

Five-Inch Curved Main, Sprung into Trench by Leverage and Wedges.

experience of the Engineers is that these steel mains are quicker to lay, cheaper, and in every way more convenient than cast iron; and with them there is nothing to fear from steam-roller or motor traffic. All services, whether to houses or lamps, are connected by the Woodall-Parkinson expansion-nipple. With steel mains, it has been found possible to go back to 2 inches diameter for many of the bye-streets—that being a size which has of late years been abandoned in cast iron. No services are less than ¾-inch; but as it is a little difficult to tap a ¾-inch hole quite true in a 2-inch main, the ½-inch expansion-nipple is used for this size, coupled to an enlarging socket. It may be added that all services-pipes also are of Mannesmann steel tube. A series of photographs has been taken of this modern system of mainlaying as exemplified at Stanford, a few of which are reproduced.

One of the photographs is of a group of specials, and indicates what can be made in steel tubes. In another it will be noticed that the main is curved. In this case, the joints are made first on top of the trench; and then the main is curved and pressed down into the trench. The joints being of the "rigid" type are not affected by the bending. Yet another photograph illustrates the testing. There is a test of about 5 lbs. pressure applied to all the mains as laid.

All the main and service laying has been superintended by the new Manager, Mr. P. W. Dillamore, a son of Mr. John Dillamore, whose name is so well known in connection with the Dillamore tar-column.

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At mid-day, a party of some twenty-five gentlemen assembled in the office on the works, for the purpose of inaugurating the supply of gas. Those present included Mr. William A. Surridge (the Chairman of the Company), Mr. James Cloudsley, J.P., and Mr. Frederick R. Smith (Directors), Mr. Ambrose Ellis (the Chairman of the Parish Council), Mr. A. W. Kerly, J.P.; Mr. W. Levitt (the Chairman of the Lighting Committee), Mr. James Randall, Mr. John Dillamore, Mr. Henry Woodall (Messrs. Corbet Woodall and Son), Mr. Samuel Cutler, jun., Mr. J. Dobson, Mr. P. W. Dillamore (the Works Manager), and Mr. W. Wilkinson (representing Mr. Cash, the Secretary).

Mr. SURRIDGE, on behalf of the Gas Company, expressed pleasure at meeting those residents who were present, and then asked the Chairman of the Council to light the first gas-burner, which was fitted in the centre of the room.

The gas was then lighted by Mr. Ellis by the aid of a match taken from a box which Mr. Surridge subsequently asked him to accept as a memento of the occasion.

Mr. SURRIDGE, addressing the company, remarked that the works had been constructed for an output of something like 5 million cubic feet per annum. The Company was incorporated in 1898; but, he supposed for want of local support, no steps were taken to erect works. In 1905, a Provisional Order was secured; but even then no progress was made until the present Directors and their friends last year took over the undertaking. They felt that some credit was due to themselves for the fact that, within twelve months of having the matter in hand, the works had been completed, and in a position to start the supply of gas to the district. There was one special feature in connection with the installation—namely, that the mains were of steel throughout. In this, they had followed the advice of Messrs. Corbet Woodall and Son; and they felt that they had done right. The Company had at present about 100 consumers and 80 public lamps. Their powers extended over a very considerable district. It was only fitting that he should acknowledge their great indebtedness to Messrs. Woodall and Son for the manner in which they had designed and carried out the works, and also to the different Contractors for the excellent way in which everything had been done. They had also to thank Mr. B. R. Parkinson (of Messrs. Woodall and Son) for the trouble he had taken, especially in connection with the laying of the steel mains. It was matter for congratulation that Mr. P. W. Dillamore, who had been in charge of the work from the beginning, was now Manager. The experience he had already gained would be greatly helpful to him in this capacity.

An inspection of the works was then undertaken, during which the process of gas manufacture was briefly explained to those who were not familiar with it; and then there was an adjournment to the Railway Hotel, where, on the invitation of the Chairman and Directors of the Company, the party enjoyed an excellent lunch, which was followed by a few short speeches.

Mr. SURRIDGE presided; and after the Loyal Toast had been duly honoured, he proposed "The Progress and Prosperity of Stanford-le-Hope." He remarked that when he first visited the place to discuss the prospects of the gas-works, he was much struck by the fact that it had a very attractive appearance and bore many of the outward marks of prosperity. One of these marks, however, it lacked. It was true that there were public lamps; but they were lighted by oil. This the Company had set themselves the task of remedying; but they must look to the inhabitants to support them in the undertaking. There were important interests in the district; and with the growing tendency to move docks, wharves, and factories nearer and nearer to the mouth of the river, there should be in store developments which might add materially to the prosperity of Stanford—to say nothing of the fact that the district was one which seemed to be becoming increasingly residential.

Mr. ELLIS, in response, said the inhabitants of Stanford regarded this as a "red-letter day;" and he himself certainly felt that the lighting by gas would be a step in the right direction, and would help to make the place go ahead.

Mr. RANDALL next proposed "Prosperity to the Stanford-le-Hope Gas Company." He said he felt that, small as the undertaking now was, it had good prospects. After drawing attention to the advantages of the prepayment meter, the incandescent burner, the cooker, and the heating stove, he remarked that the Directors of the Company were men of strict probity, who would do everything thoroughly and would meet every reasonable requirement in the way of main extensions. As to the Manager and the workmen, they were indebted to them for the part they had taken; and he coupled with his toast the names of the Chairman and Directors and the staff generally.

Mr. SURRIDGE, on behalf of his colleagues and himself, thanked Mr. Randall for his remarks. They believed, he added, that they had embarked on an enterprise which would prove a success. At all events, they would do their best to make it so. If they had a regret, it was perhaps that so few of the local people had so far cared to take an interest in the concern. This, however, was not an unusual experience by any means in the early history of gas-works. Possibly in the present case this abstention was partly owing to the fact that there was not very far away a conspicuous failure in gas enterprise; but this was conceived, as he was sure they knew, on widely different lines from those on which the Stanford undertaking had been started. He hoped, therefore, that when the days of prosperity came to the Company, the residents would remember that the Directors had held open the door to them on exactly the same terms as they had subscribed capital themselves; and when the shareholders were securing, as he hoped they would, a good return on their investment, the inhabitants must not grudge them the reward of their enterprise.

Mr. CLOUDSLEY remarked that for the equipment of the undertaking they had so much admired, they were much indebted to Messrs. Corbet Woodall and Son, whose guidance they were glad to have had. There was present a partner in the firm—Mr. Henry Woodall—who had taken great interest in this little concern. He had therefore pleasure in proposing "The Consulting Engineers," because they had done much to bring the undertaking to successful completion.

Mr. HENRY WOODALL, in acknowledgment, said it had been a great pleasure to him and to his firm to be associated with the works. It was a little undertaking now; but they hoped it would be a big one some day. Of course, engineers, however well they designed and did their work, were much dependent upon the people who carried it out; and in this respect his firm had been highly fortunate. Mr. Dobson and Mr. Cutler had done their work very well; and the Company had an excellent Manager in Mr. Dillamore. They could well congratulate themselves that the man who was to take charge of the works had had

the task of looking after the erection of them. Mr. Dillamore had taken the greatest possible interest in his work, and had displayed much energy and enthusiasm. His firm was most satisfied with the works and with the mains. They had tested the latter, and found they were practically sound; and one thing they would avoid was the serious leakage encountered where mains were not well laid. He hoped the works would increase, and that Mr. Dillamore would remain as Manager until he had some day charge of a large undertaking. He would also like to thank Mr. Parkinson, who had greatly assisted the work, and who was an authority on mainlaying. The Chairman had mentioned that the unique feature about the works was that all the mains were steel. In these days of heavy traction and much vibration, he thought steel mains would be a great help; and so he was glad to be connected with a Company that was the first to adopt the principle of using steel mains wherever possible.

Mr. KERLY remarked that for some years he was Chairman of the Parish Council; and during that time the question of lighting came up. Some of them thought the time had arrived to start a company, and one was registered, without any idea of obtaining a Provisional Order. They were advised that a gas-works could be started for a very moderate sum; and £3000 was subscribed. Then some one came into the village and said that gas was quite behind the times, and the place ought to be lighted by electricity. If the gentleman who offered them electricity could have done all he said he could do, there was no doubt they were mistaken in deciding to light by gas. A parish meeting decided in favour of adopting the electrical scheme; but it came to nothing, and they were again faced with the question of what they should do. They had returned the money subscribed for the Gas Company; and so the Parish Council decided on oil-lamps. Later on, as they knew, the Gas Provisional Order was applied for. This was the history of the whole matter. He had had many offers from companies of very doubtful capacity to take the thing over; but he was pleased to say he always resisted them. He and those connected with them felt that they would rather let the thing drop, than for it to get into the wrong hands. Now they had associated with the enterprise gentlemen who intended to make the business a success. Stanford was to be congratulated on having such works; and he trusted the Company would be rewarded by receiving maximum dividends on the money they had expended. They deserved no less. Even if for the moment the cost of gas should be a little more than that of oil, they ought to disregard this. He did not, however, agree that it was so, because he believed that the extra convenience, saving of labour, cleanliness, &c., made up for any slight extra cost. Anyway, they should not make their calculations too closely, but should give their favour to the gas people, who had done so important a thing in the interests of Stanford.

Mr. LEVITT, speaking as Chairman of the Lighting Committee, said they recommended gas for the streets because they felt convinced that they would be excused if they did for the first year or two possibly exceed the sum of money which it was their custom to spend on public lighting. They felt sure that in the end they would be justified. He wished the Company every success, and trusted the inhabitants of the surrounding villages would take up gas, so that in the near future the shareholders might receive a good return on their outlay.

## REGULATED AIR-BLAST FOR BREEZE FIRING.

Herr B. Knüpfer, Gas Superintendent at Belgard, described in a recent number of the "Journal für Gasbeleuchtung" a new type of air-blast for boiler furnaces, in which coke breeze is used, of which he has had experience. It is made by the firm of Müller and Korte, of Pankow, near Berlin. There is a positive pressure under the grate, which is of the usual injecting grate-bar type; the width of the air-spaces being regulated according to the working conditions. The peculiarity of the new arrangement which distinguishes it from older types is that the air is injected beneath the grate by a steam injector, provided with a regulating arrangement through which the steam introduced is subjected to special compression, so that a smaller quantity suffices to force the requisite amount of air under the grate and to produce the necessary pressure. This regulating arrangement is quite independent of the valve operated by the stoker. The steam consumed, according to Herr Knüpfer's observations, amounted to only about 6 per cent. of that produced, and the evaporation was about 5·23 times the weight of breeze employed. Taking the calorific value of the breeze at 9360 B.Th.U. per pound, and the temperature of the feed water at 64° Fahr., the efficiency of the boiler was 64·3 per cent., and the amount of steam produced per square foot of heating surface per hour was 5 lbs. This is a better result than is frequently obtained, even with coal firing; and, having regard to the fact that the coke breeze has such a comparatively low calorific value, the cost of steam for producing the requisite air pressure under the grate is regarded by Herr Knüpfer as particularly satisfactory in comparison with the output of the boiler.

We have received from the Principal of the Municipal School of Technology, Manchester, the calendar for the session 1909-10. It is a bulky volume, on pp. 397-401 of which will be found particulars of the classes in "Gas Engineering and Supply" and "Technical Gas Analysis." The Chemistry Section is conducted by Mr. W. Buckley (Ordinary Grade) and Mr. F. S. Sinnatt. "Technical Research and the Construction of Plant" are subjects which are in the hands of Dr. Grossmann. The course in "Coal-Tar Products" is conducted by Professor E. Knecht. The price of the calendar is 6d., or 10d. by post.

## GASEOUS EXPLOSIONS.

### Second Report of the British Association Committee.

At the Meeting of the British Association in Winnipeg which closed last Wednesday, the Committee appointed for the investigation of gaseous explosions, with special reference to temperature, presented their second report. The members of the Committee are Sir W. H. Preece (Chairman), Mr. Dugald Clerk and Professor Bertram Hopkinson (Joint Secretaries), Professors Bone, Burstall, Callendar, Coker, Dalby, and Dixon, Drs. Glazebrook and Hele-Shaw, Professors Petavel, Smithells, and Watson, Dr. Harker, Lieut.-Col. Holden, and Captain Sankey. Their first report was given in the "JOURNAL" this time last year (Vol. CIII., pp. 719, 793). In due course the second report will appear in our pages; but meanwhile it will be of advantage to publish the following paper submitted to the Engineering Section of the Association by

### MR. DUGALD CLERK ON THE WORK OF THE COMMITTEE.

Both the steam-engine and the internal-combustion motor had attained great practical utility, and reached a comparatively advanced stage of development, before much knowledge was available of the properties of the working fluids employed. Continued progress, however, requires very complete knowledge—in the one case of the properties of steam, and in the other case of the physical and chemical properties of a gaseous explosion and the combustion products resulting therefrom.

Though it is now 135 years since the date of James Watt's success at Soho, near Birmingham, knowledge of the properties of steam as a working fluid is by no means complete. Accordingly, it is not surprising that during the shorter history of the practical period of the internal-combustion motor, physicists, engineers, and chemists have so far failed to obtain a complete knowledge of the properties of gaseous explosions and the products of such explosions at high temperatures.

The internal-combustion motor has reached the stage when further development in many directions depends upon an intimate knowledge of the properties of the working fluid and of the phenomena of heating that fluid by combustion. The object of the Gaseous Explosions Committee of the British Association is to combine the work of physicists, chemists, and engineers, in order to determine with accuracy the phenomena and physical constants involved in the operation of the working fluid within the cylinder of the internal-combustion motor. As befits a Committee of the British Association, most of the work is of a purely abstract nature, which might be appropriately conducted by either the Physical or the Chemical Section.

As the direct practical application may not be clear to some engineers, Sir William H. White, our distinguished President, has asked me to write this note, pointing out the practical application of the knowledge acquired by investigation to the urgent present problems of the internal-combustion motor. Accordingly, I propose to deal shortly with some points of engineering importance which require further knowledge of physical and chemical phenomena before they can be accurately dealt with, and I begin with the important question of

#### THERMAL EFFICIENCY AND ITS LIMITS.

A very large part of the work of the gas-engine inventor and designer has been devoted to improving the thermal efficiency of the engine, with the result that it has risen from 16 to 37 per cent. in twenty-six years. The following table shows this very clearly.

*Indicated and Brake Thermal Efficiency of Four-Cycle Engines from 1882 to 1908*

| No. | Mechanical Efficiency. | Names of Experimenter. | Year. | Dimensions of Engine. | Indicated Thermal Efficiency. | Brake Thermal Efficiency. | Type of Engine. |
|---|---|---|---|---|---|---|---|
| | Per Cent. | | | Diameter in. × Stroke in. | Per Cent. | Per Cent. | |
| 1 | 87·6 | Slaby . . . | 1882 | 6·75 × 13·70 | 16 0 | 14·0 | Deutz. |
| 2 | 84·2 | Thurston . . | 1884 | 8·50 × 14·00 | 17·0 | 14·3 | Crossley. |
| 3 | 86·1 | Society of Arts | 1888 | 9·50 × 18·00 | 22·0 | 18·9 | Crossley. |
| 4 | 80·9 | Society of Arts | 1888 | 9 02 × 14·00 | 21·0 | 17·0 | Griffin (6-cycle). |
| 5 | 87·3 | Kennedy . . | 1888 | 7·50 × 15·00 | 21·0 | 18·3 | Beck (6-cycle). |
| 6 | 82·0 | Capper . . | 1892 | 8·50 × 18·00 | 22·8 | 17·4 | Crossley. |
| 7 | 87·0 | Robinson . . | 1898 | 10·00 × 18·00 | 28·7 | 25·0 | National. |
| 8 | 83·0 | Humphrey . | 1900 | 26·00 × 36·00 | 31·0 | 25·7 | Crossley. |
| 9 | 81·7 | Witz . . . | 1900 | 51·20 × 55·13 | 28·0 | 22·9 | Cockerill. |
| 10 | 85·5 | Inst. of Civil Engineers . | 1905 | 14·00 × 22·00 | 35·0* | 29·9 | National. |
| 11 | 77·1 | Burstall . . | 1907 | 16·00 × 24·00 | 41·5† | 32·0 | Premier. |
| 12 | 87·5 | Hopkinson . | 1908 | 11·50 × 21·00 | 36·8 | 32·2 | Crossley. |

* The value—35 per cent.—is deduced by the author from the Institution of Civil Engineers' Committee's values.
† This value is, in the author's view, too high; probably due to indicator error.

Indicated and brake thermal efficiencies are given in the table, together with mechanical efficiency. These indicated thermal efficiencies give the proportion of the total heat of combustion of the fuel supplied, which is converted into indicated work acting on the motor piston. These greatly improved results have been attained,

broadly, by following the definite theory that thermal efficiency is increased by diminishing the volume of the combustion space relative to the volume swept by the piston. The question now arises: Can we greatly improve thermal efficiency by further developments in the same direction? This question can only be answered when we attain a minute knowledge of the properties of our working fluid. The guide hitherto adopted by engineers has been what is known as the air standard. This assumes an engine to go through all its operations of charging, compressing, adding heat, expanding, doing work, and exhausting, with pure air as its working fluid; and the air so used is assumed to have certain definite physical properties and a constant specific heat. On these assumptions, it is possible to calculate indicated thermal efficiencies for any given proportions of engine and compression space where loss of heat is assumed to be absent.

Comparing efficiencies so calculated with those actually attained, it has been sought to obtain some idea of the relative performances of different engines compared with a standard. It has long been known, however, that though the air standard is exceedingly useful for comparative purposes, yet it does not supply an absolute measure. If we take, for example, the indicated thermal efficiency of an ordinary four-cycle gas-engine (say) as 35 per cent., and compare this with the ideal efficiency for the same engine using air as the working fluid without heat loss, we find that the real engine converts only 70 per cent. of what would be converted by the ideal engine. If air had the same properties as the real working fluid, this would mean that 30 per cent. improvement was still possible, if we could build an engine suppressing all heat losses. From some calculations made by me about two years back, on the known properties of gaseous explosions, I was able to prove that the actual working fluid of the engine, even if so used as to suffer no heat loss whatever, could not be so efficient as air. With the actual working fluid, I found that such an engine as above indicated was really converting 88 per cent. of all the heat which it could possibly have converted into work, having regard to the properties of the mixture of nitrogen, oxygen, steam, and carbonic acid forming it. These calculations rested upon determinations of the properties of gaseous explosions made by Mallard and Le Chatelier, Langen, Holborn and Henning, and Clerk, which differed from each other to some extent. If the adopted numbers be true, then by suppressing all heat losses in a modern internal-combustion motor cylinder we could only increase the thermal efficiency from 35 to nearly 40 per cent. It is, of course, impossible to suppress all heat losses; accordingly, it would appear that the margin available for future improvement in thermal efficiency is small.

These calculations as to possible efficiency depend upon an accurate knowledge of the total energy of a mass of hot gas within a cylinder under different conditions, and necessitate an accurate knowledge of temperature and apparent specific heat of the gases dealt with. This knowledge it is the object of the British Association Gaseous Explosions Committee to supply. Accordingly, experiments have been arranged in conjunction with the various investigators forming the Committee to enable correct determinations to be made, and to eliminate satisfactorily the errors at present known to exist. When the values of temperature and apparent specific heat are correctly determined, then and then only will it be possible to define with accuracy the limits of efficiency proper to any cycle of operations. The difficulties of the task will be apparent to the engineer who peruses the two reports of the Committee. He will find that all methods of determining the apparent or real specific heat of gases at high temperatures are open to criticism. The latest determination up to temperatures such as 1200° C. are those of Holborn and Henning, of Berlin, and Clerk, of London. The German experiments were made by means of a thermopile and calorimeter in a manner very similar to Regnault's earlier work on nitrogen, air, and carbonic acid at lower temperatures; and Clerk's experiments were made in the cylinder of a 60 H.P. gas-engine by a new method—that of alternate compression and expansion. Clerk's values are throughout about 10 per cent. higher than Holborn and Henning's.

In discussing the possible error of both methods of experimenting, Professor Callendar points out that the corrections necessarily introduced by Regnault's method lead to a result which may be as much as 3 per cent. too low, even when working at a temperature no higher than 100° C. He further points out that Holborn and Henning, working at higher temperatures, such as 1200° C., may increase this error to 10 per cent. Professor Hopkinson, on the other hand, suggests that Clerk's experiments may be subject to a systematic error due to unequal division of heat loss between the compression and expansion stages; and he considers that this possibly unequal division may cause an error in Clerk's values of about 7 per cent. excess. Callendar thus considers that Holborn and Henning's results may be too low; while Hopkinson leans to the view that Clerk's results are too high.

The second report of the Committee carries discussion a stage further. Swann's elaborate experiments by means of Callendar's method prove that Regnault was about 2 per cent. too low in his specific heat value for air; and further experiments by Clerk on the specific heat of dry air by his method of compression and expansion show values 3 per cent. higher than Swann's, and prove that under the conditions of a particular set of his experiments the heat-loss division between compression and expansion lines is not correctly given by the proportion between the two mean temperatures. Hopkinson is therefore justified in calling attention to this possible source of error.

Later experiments made by Clerk, calculated since the second report was settled by the Committee, supply some proof that more effective cooling of the engine cylinder, by a rapid flow of water through the jacket, restores the proportionality between the heat loss on compression and expansion lines; and specific heat determinations made on the same engine show the value for air obtained by Clerk's method to be within 1 per cent. of Swann's value for the same temperature. It is therefore probable that Clerk's method is reasonably free from systematic error at high temperatures, such as 1000° C. It is hoped that new values so determined will be available for next year's report. The rivalry of the different methods is most interesting to the Committee; and it is felt that, by continued experiment and discussion, close approximations to true values will ultimately be obtained.

The question of temperature is also vital to the work of the Committee; and its correct determination involves subsidiary, but difficult, investigations on the questions of chemical equilibrium, dissociation, and thermal distribution, which are being dealt with by chemists (Professors Bone, Dixon, and Smithells), by physicists Drs. Glazebrook and Harker and Professor Watson), and by engineers (Professor Dalby and the present writer). Some progress has been made in the two years of work, especially in the application of accurate optical indicators; and it is hoped that further information will be available within another year.

Even with our present knowledge, however, it is becoming increasingly evident that certain limits are close upon us, and that further increases in indicated thermal efficiency will be possible only by considerable alterations in the actual thermal cycle used, and that little further development is possible on the old lines of increasing compression. To decide, however, which is the direction of advance, it is necessary to know very accurately both temperature and specific heat, as I have indicated.

Maximum temperatures of 1700° C. are usual in economical internal-combustion motors; and a perfect heat-engine taking in all its heat at that temperature, and discharging only that necessary on the Carnot cycle at 17° C., would give a thermal efficiency of 85 per cent. The highest actual efficiency obtained so far is about 37 per cent.; and this is about 87 per cent. of what its perfect cycle would allow. This is obviously far short of the Carnot cycle efficiency; and it appears possible that actual efficiencies as high as 50 per cent. may be obtained by modifying the existing cycle so as to attain greatly increased expansions by compounding and condensing. The use of the regenerator may even become possible in large engines operating on changed cycles.

### Problems Depending on Knowledge of Heat Flow.

Although further improvement in thermal efficiency is of high scientific interest, for the present the efficiencies already attained are sufficiently good. Indeed, they may be considered as having overrun the existing stage of development of the large gas-engine considered as a mechanism; that is, large engines require attention more on the mechanical than on the thermodynamic side. The work of the Committee is of the utmost importance in this connection.

Commercial gas-engines are usually designed to take safely a regular maximum pressure of 400 lbs. per square inch; but in the event of pre-ignition they may have to stand 500 lbs., or even more. In an engine so designed, the working mean pressure will not usually exceed 80 lbs. per square inch. The maximum pressure in the engine cylinder is usually about five times the mean pressure. In engines of moderate dimensions, giving (say) up to 200 I.H.P. per single-acting cylinder, it is not very difficult to comply with all the mechanical conditions necessary for safety and continuous working under heavy loads. The case is very different, however, in gas-engines of really large dimensions. The largest power at present claimed as produced in a single double-acting four-cycle cylinder is about 1200 H.P., and the cylinder is about 45 inches diameter and 51-inch stroke and the revolutions 94 per minute. To construct an engine with so large a cylinder, and get it to operate with freedom from breakdown, taxes to the utmost the resources of the skilled designer and constructor. Great credit is due to those persevering Continental, English, and American gas-engine designers who have devoted so much time, skill, and money to overcoming the difficulties of these large constructions. Though a certain measure of success has been attained, it is success with important limitations. I cannot help feeling that, before any permanent financially successful development of the large-cylinder gas-engine can be hoped for—such a development, for example, as would permit an engine of 10,000 H.P. to be applied for marine purposes—it will be necessary to do more than skilfully meet the various difficulties in a mechanical way. It will be necessary, in fact, to re-design the thermodynamic cycle of the large gas-engine in order to obtain a closer approximation to the easier mechanical conditions of the large steam-engine.

The conditions of the steam-engine are very much less onerous than those of the gas-engine. In the matter of mean pressures, for example, no marine steam-engine exists where the ratio of maximum to mean pressure in any one cylinder is so high as 5 : 1. The temperature conditions, too, of the steam-engine are much more gentle. It is quite possible to re-design the gas-engine cycle in such a way that maximum pressures do not exceed (say) 150 lbs. per square inch, while mean pressures of 70 lbs. per square inch are obtained. It is also possible to diminish the flame temperature used within the cylinder to such an extent as to greatly reduce the heat flow through the cylinder walls. To do this,

however, and produce (say) a 10,000 H.P. marine gas-engine, it is necessary to know with considerable accuracy the rate of heat flow from hot gases at certain temperatures—say, between 2000° C. and 800° C.—that is, the rate of heat flow from those gases to the enclosing cylinder walls. It is also necessary to know how this flow is affected by variations in the density of the gas. Further, it is necessary in designing such large engines to discover some method of entirely suppressing pre-ignitions. Consider the position of a marine-engine designer designing a large marine steam-engine (say) if he be told that his ordinary maximum pressure, as supplied by the steam-boiler, is 150 lbs. per square inch, but that he must so design his engine that if 300 lbs., or even 400 lbs., per square inch perchance comes upon it, it must not break down under that added stress. It would be hardly possible to design a large steam-engine with such a condition overhanging him.

Part of the work of the Committee consists in determining the conditions of heat flow to the cylinder walls, and the amount of the heat flow under certain conditions at various densities and temperatures. Given this knowledge, it will become possible to design engine cycles whose mechanical conditions are much less rigorous than those existing in the large gas-engine of to-day. Such a cycle must have low maximum pressure, relatively high mean pressure, low mean temperature, and as low density of working fluid as is compatible with economy at certain portions of the thermodynamic cycle. The conditions of heat flow are being carefully studied by four members of the Committee—Clerk, Coker, Dalby, and Hopkinson. So far only approximate values are known; but continued investigation will undoubtedly enable sufficient accuracy to be attained.

To enable high-temperature determinations to be made, it was found necessary to reconsider much of the low-temperature work; and even Regnault's determinations of, for example, the specific heat of air, were found, as has been shown, to be erroneous to the extent of 2 per cent. Now, 2 per cent. error at low temperature is not of any great moment from the engineering point of view; but it introduces much larger errors when high temperatures are studied, so that even the low-temperature work must be revised. The Committee are fortunate in having the co-operation of Professors Callendar and Watson in the consideration of this work; and Professor Glazebrook and Dr. Harker are giving valuable aid at the high-temperature end. Other physical problems arise which require consideration. The problem of radiation from a gaseous explosion, for example, is one which has a considerable bearing upon the mechanical conditions at the high-temperature end of the thermodynamic cycle. Other physical problems are being dealt with, such as the heat distribution throughout the walls of the combustion space, the valves, and the piston end. Professor Hopkinson has done valuable work in this connection. The conditions of chemical equilibrium within a gaseous explosion are also of moment from the practical point of view; and Professors Bone, Dixon, and Smithells are rendering valuable aid, in co-operation with the physicists, to determine what really goes on at the explosion end of the engine cycle.

Existing large gas-engines are disproportionately heavy and bulky for the power developed by them; and increase of power with reduction of weight can only be attained by compromise between conflicting conditions. The gas-engine designer cannot even consider the points of difference without minute knowledge of the conditions of heat flow to the walls and heat distribution in them. This knowledge the Committee hope to acquire, both for the benefit of abstract science and the applied science of the engineer.

## Another Presentation to Mr. John Bond.

The presentation to Mr. John Bond, the Gas Engineer of the Southport Corporation, by the officials and workmen at Crowlands, on the occasion of his marriage, to which reference was made in the "JOURNAL" last week, took place on the 30th ult. There was a large gathering, presided over by Mr. C. H. Kenyon, the Chief Clerk of the Gas Department, who asked Mr. Walmsley, the Assistant-Engineer, to make the presentation, which consisted of a handsome quarter-chime mahogany clock, inlaid with brass, and bearing the following inscription: "Presented to John Bond, Esq., by the Gas Works Employees, Crowlands, Southport, on the occasion of his Marriage, September 1st, 1909." Mr. Walmisley said it afforded him very great pleasure, on behalf of the employees of the Southport Gas-Works at Crowlands, to make the presentation, as a token of their high appreciation and esteem of their worthy chief, on the occasion of his marriage. It was needless to say that he was voicing the opinion of all present when he wished Mr. Bond and the bride-elect long life, good health, and prosperity. He trusted Mr. Bond would long be spared to look upon the time-piece with many pleasant reminiscences of the Southport Gas. Works. Mr. Bond, in acknowledging the gift, said he felt sure, when he first became acquainted with the officials and workmen of the Gas Department, that his lot would be a happy one. Now that he had been with them for more than five years, he could with confidence tell them that his first impressions of their capabilities had been fully realized; and he felt proud to know that he had friends about him of the very highest order. He looked upon and accepted their handsome present as a seal of their friendship, and also as a token that marked the time in his affairs which he would always greatly treasure. He thanked them most heartily for the kind words which had been spoken not only to him but also for his future wife, and for their handsome gift.

## LARGE GAS-ENGINES.

The technical portion of the proceedings connected with last Saturday's "Engineering Day" at the White City included an interesting lecture on "Large Gas-Engines," by Mr. Percy R. Allen, who displayed in connection with it a number of lantern slides illustrating engines and plant of different kinds. He also provided a fine collection of gas-engine photographs, drawings, and models, which were arranged for inspection in the Machinery Hall. The meetings were held in the Congress Hall; and each paper or lecture was presided over by a gentleman prominently associated with the particular branch of engineering which was the subject of the contribution.

Mr. DUGALD CLERK most appropriately filled the chair during the lecture on "Large Gas-Engines;" and in opening the proceedings, he remarked that Mr. Allen was very well qualified to tell them about the matter with which he was going to deal, because he was Engineer to a large Company who employed gas power for the generation of electricity; and in the works he had some large Körting engines operating on the Clerk cycle, some National engines, and some engines of the Westinghouse type. He had also been studying the whole question on the Continent, and so was in a position to inform them how far the gas-engine had developed, in the large size, for different industries. It was a matter of great importance to the United Kingdom, because it had been said by some that this country was behind the rest of the world with the large gas-engine. He (Mr. Dugald Clerk) did not agree with this. Englishmen built things when they thought it would pay them to do so; and as soon as those who were engaged in the industry felt that they were going to make money by the construction of large gas-engines, it would be found that plenty of them would be built. At present the question was in the initial stage, which must, of course, be passed through; but work was being done in this country, as well as elsewhere.

Mr. ALLEN (whose lecture was read for him by Mr. W. Yorath Lewis, the Hon. Secretary to the conference) at the outset stated his intention to deal with the aspect of the gas-engine, as compared with steam power, on somewhat general lines. Tracing the history of the subject, he remarked that the gas-engine might be considered to have become a really commercial machine when Dr. Nicholas Otto designed his first engine using the Beau de Rochas cycle, in 1875. The manufacture of these engines was undertaken by the firm of Otto and Langen, which had since developed into the well-known Gasmotoren Fabrik Deutz. About this time Messrs. Crossley Bros. made arrangements to build this type of engine in England; and since then an enormous number had been constructed on this system, which soon became known as the Otto cycle. This cycle he explained at length, showing a number of slides of representative engines built by Messrs. Crossley. Between 1875 and 1895, he continued, there was no very striking change made in the general design of this type of engine; but when, in 1894, the late Mr. H. B. Thwaite demonstrated that, by taking blast-furnace gas and properly cleaning and cooling it, it became possible to use it in gas-engines with a fairly high degree of compression, he opened up an enormous field for the profitable employment of large internal combustion engines, the full importance of which seemed hardly appreciated yet, at all events in this country. Although Thwaite's patent appeared to have slightly ante-dated that of anyone else, in 1895 the John Cockerill Company had a small gas-engine working on blast-furnace gas; and in less than five years they had developed the idea to such an extent that they were enabled to show at the Paris Exhibition in 1900 a large blowing engine intended to be driven by blast-furnace gas, and capable of developing 600 H.P. in a single cylinder. This engine was still at work at Seraing. In Germany, the idea of using blast-furnace and coke-oven gases was at once taken up; and a gas-engine working on the Oechelhaeuser two-cycle system was constructed and put to work in 1898 at the Hoerde Iron and Steel Works, near Dortmund. This engine developed upwards of 600 H.P., and led the other makers building the Otto type of engine to seek to increase their power by multiplying the cylinders; a 1000 H.P. four-cylinder *vis-à-vis* twin engine being supplied by the Gasmotoren Fabrik Deutz and put up in the same house at Hoerde. However, by 1904, the Deutz Company had quite remodelled their engine; and, while retaining the Otto cycle, made the cylinders double-acting. Since then, with various modifications, nearly all the makers of large engines using the Otto cycle on the Continent and in America had built them double-acting.

The two-cycle engine, said the author, seemed really to have been first practically worked out by Mr. Dugald Clerk; but it was apparently not built on any large scale until the Oechelhaeuser and the Körting engines began to be constructed. Though both these types of engines were always spoken of as "two-cycle" engines, there was considerable difference in their exact action. This difference he indicated at length. There were, he added, several possible systems of working outside the four-cycle Otto and the two-cycle Körting or Oechelhaeuser; but they were not at present put into practical use. The six-stroke cycle, in which, after the exhaust stroke, a separate charge of pure air was drawn in, and then expelled between the exhaust stroke and the suction stroke, came in for a certain amount of favour. It no doubt formed a most effective scavenge; but the same result had since

been obtained—particularly in the Premier engine—with a four-stroke cycle combined with an independent air-pump for supplementing the discharge from the exhaust.

After dealing with further constructional details, Mr. Allen went on to say that the internal combustion engine differed from the steam-engine inasmuch as a certain amount of heat had to be deliberately wasted—that was, the cylinders, the cylinder-heads, and in large engines the pistons and exhaust-valves, had to be water-cooled; otherwise the cumulative effects of the succession of explosions would raise the temperature to such a degree that the engine would cease to act. It had frequently been proposed to utilize the heat in the cylinder jackets as a means of raising steam, which could be used to help the output of the main engine. From one point of view there was nothing wrong in theory about this; and with the recent developments made in exhaust steam turbines, it was open to consideration whether it might not pay in a large installation, even taking into account the extra capital outlay. However, while this possible economy had only been dealt with in an experimental way, the heat rejected in the exhaust was now systematically made use of—the burned gases being turned through a multitubular boiler before passing into the atmosphere. An ordinary gas-engine might be roughly reckoned to consume about 70 cubic feet of producer gas having a value of 145 B.Th.U. per cubic foot per brake horse power hour; and this would be found to raise about 2 lbs. of steam at 70 lbs. pressure for each brake horse power hour exerted. Of course, the more efficient the engine, the less heat there was to be caught in the exhaust; but at the same time, where there was any possible use for steam or hot water, the exhaust boiler had come to be recognized as a necessary adjunct to the engine.

The earliest gas-engines were, the author pointed out, almost always worked off town gas; and up till quite recently this had invariably been produced with the idea of getting the greatest possible amount of light from it, quite independent of its heating properties. However, when it came to be generally recognized that the gas-engine was a comparatively economical machine, even with town gas, inventors began to devise apparatus for producing gas more specifically adapted for power purposes. There was a long list of inventors of gas-producers; but Wilson and Dowson were among the first to give serious attention to such plants for motive power. At present producers were upon the market which would gasify almost anything containing carbon. In 1895, Bénier, a French inventor, patented the idea of a suction gas producer; and this idea was taken up with great vigour, and had been more largely used than even the inventor could have contemplated. Suction plants were now offered up to about 600 or 700 H.P.; but as yet they were not adapted for fuels of a bituminous nature. One of the most remarkable suction plants with which he was acquainted was supplied by Messrs. Crossley to a Liverpool firm. Here three suction gas producers were placed on the roof of a very high building, and supplied gas to three engines working in parallel in the basement. Producers using oil as a fuel had been to some extent used.

Mr. Allen remarked that very considerable impetus was given to the construction of large gas-engines in this country when the Mond system of using bituminous fuels and gasifying them at a low temperature (at the same time recovering sulphate of ammonia as a bye-product) was proposed. He explained fully, with the aid of lantern slides, the construction and working of the Mond and Duff producers, and then indicated the efforts made by Messrs. Crossley and the Power Gas Corporation to simplify the working of ammonia-recovery plants. Continuing, he remarked that, as most people were probably aware, a large amount of experimenting had been done in years gone by with regard to the utilization of peat as a fuel. Up to the present, this had never been much of a commercial success; but it would seem that in the recent developments of large producer plants and bye-product recovery apparatus, peat might become quite a payable proposition for them to deal with. In this connection, he referred to the work that had been done by Captain H. Riall Sankey. As to the future price of sulphate of ammonia, the author said that, though the production had enormously increased of late years, the opinion of those agriculturists who had studied the subject most seemed to be that in the next 25 years the demand for artificial fertilizers for the regular production of the wheat crop would lead to a large and permanently increasing demand for nitrogenous compounds, not as bye-products, but as staple articles.

Coming to a short consideration of the commercial comparison between the gas-engine or internal combustion engines generally and the steam-engine, Mr. Allen thought it might be safely stated that the consumption of fuel in a gas-engine was only about half that in a steam-engine—or, rather, about 17·5 to 9·5. The steam-engine consumption had no doubt been improved of recent years, but still under ordinary conditions there would be a marked economy of fuel in connection with a gas-engine; and if the installation were large enough to justify an ammonia recovery plant, there would in the first place be a saving of one-third of the fuel, and then there would be received back (say) one-third of the value of the slack in the form of bye-products. Installations of 20,000 H.P. and upwards, driven by large gas-engines, were now to be met with in several places. Most of the Continental steel works did not deem it necessary to provide any spare steam plant as a stand-by for their gas-engines; so that the practicability of working a large gas-driven station might be taken as settled. However, in this country the electrical engineer, who was responsible for most of the power schemes that came forward, had hesitated, on the ground of capital expenditure, to recommend large units and producer plants; the argument being that if there was a poor load-factor running in an uncertain manner during the 24 hours, one was not justified in spending the extra money on the more economical gas-engine, instead of the cheaper turbine which used more fuel. This matter was, of course, governed largely by the arrangements it might be thought prudent to make for interest and depreciation, sinking fund, or redemption charges, which were more or less settled by the commercial management of the enterprise, and with regard to which a great amount of argument might be indulged in.

At the present moment, the capital expenditure involved on a 10,000 kilowatt plant, with gas-engines, producers, and recovery apparatus, would be about £17 per kilowatt; while with a steam condensing plant and large turbines it would be somewhere between £12 and £14. It must be admitted, he said, that now the large gas-engine was a more expensive machine to construct than a steam-engine, or especially a steam-turbine; and the reason of this could be understood. To obtain a mean effective pressure of (say) 70 lbs. in a gas-engine cylinder, the crank-shafts, bearings, and all the working parts had to be made to stand the explosion pressure—say, 350 lbs.; while in a steam-engine the maximum pressure coming on any part rarely exceeded from 180 to 200 lbs. But assuming for the moment that the capital expenditure on a large gas-engine plant with producers was too high, directly one began to use the engine in connection with the waste gases from blast-furnaces or coke-ovens, the position was quite different. In the blast-furnace and coke-oven, there was the producer already made; the gas was burned in the engine to just twice the advantage as was the case under the boilers; the space occupied by the plant was smaller; and the total capital cost worked out less. Unless some means could be devised for producing a fuel equal to coal, they were under a moral obligation to their successors to be as sparing with coal as possible; and moreover virtue was sometimes its own reward. In a time of shortage of supplies from any cause, an engineer with a gas plant who had 1000 tons of coal on hand would be in a position to carry on operations just twice as long as his neighbour with a similar amount who had stuck to steam.

The lecturer concluded with a few remarks on oil-engines of the Diesel type, and their utilization for marine purposes.

Mr. Dugald Clerk, in proposing a vote of thanks to Mr. Allen, remarked that there was no time for discussion upon what they had heard. It was marvellous to think that every possible fuel now—liquid, solid, and gaseous—had been pressed into the service of the internal combustion engine. When he (the speaker) began work in 1876, the largest gas-engine in England was only 3 H.P.; while now there were engines of 2000 H.P. at Beardmore's works in Glasgow, on the Oechelhaeuser system, and in Mr. Allen's own works there was a Westinghouse engine of 1000 H.P., a Körting engine of 750 H.P., and some smaller ones. There was no doubt at all that the large gas-engine was coming much into commercial use; and he trusted that England in the future would take a foremost place in the building of such engines—on better lines, he hoped, than anyone else.

Mr. F. L. Rawson having seconded the vote, it was heartily accorded; and Mr. Allen briefly acknowledged it.

## Glover-West Vertical Retorts for Manchester.

The Chairman (Mr. Alderman Gibson) and the Gas Committee of the Manchester Corporation, together with their Engineer (Mr. J. G. Newbigging, M.Inst.C.E.), and the Managers of the various stations, recently visited St. Helens, and inspected the working of the Glover and West vertical retorts; and, on the recommendation of their Engineer, they decided to consider the advisability of erecting an installation at one of their stations. A proposal was at once invited from West's Gas Improvement Company, Limited, for a complete installation, including a suitable retort-house building and coal-store; and the Gas Committee have accepted it. The installation will be erected at the Droylsden Gas-Works, where it will be possible to make complete and separate tests of the working of the vertical retorts against the existing carbonizing plant. In view of the fact that the Engineer will shortly have to draw up plans for works of a capacity of 10 million cubic feet of gas per diem, the results from this installation of vertical retorts will be a guide as to the carbonizing methods to be adopted.

**High-Pressure Gas Lighting at the Alexandra Palace.**—At a meeting of the Alexandra Park Trustees last week, the Executive Committee reported that arrangements had been entered into with the Tottenham and Edmonton Gas Company for installing plant for high-pressure lighting, by which not only would a certain portion of the palace and grounds be more efficiently lighted, but a very considerable saving would be effected in the annual cost. The erection of the necessary plant was now in hand, and it was expected that the improved lighting would in a short time be in operation in the central hall, corridors, industrial hall, exhibition department, skating rink, terraces, &c. The plant—consisting of engines, compressors, central control-board, &c.—was being erected in the exhibition department; and as it was enclosed in a glass case, it was thought that it would be an object of great interest to the public visiting the building.

## TAR MACADAM FOR ROADS.

At the last Annual Meeting of the Wisconsin Gas Association, Mr. J. D. TAYLOR, jun., the Manager of the Wausau (Wis.) Gas Company, read a paper on "Tar Macadam," in the course of which he made the following remarks.

We have all taken great interest in the upbuilding of our coke market, spending a considerable amount of money each year in advertising "smokeless fuel," and installing crushers, &c., to find in the end that we are dependent largely upon a seasonable winter to unload our stock, very often having to close out at a low figure at the end of the season to make room for the summer accumulation. The larger plants, of course, all operate and maintain ammonia concentrators; while the managers of the smaller ones are continually figuring as to the possibilities of their doing the same.

The operators of both the large and the small plants seem to overlook the value of their tar, and place the entire output by annual contracts with the few large contracting firms, for which they receive an exceedingly low price compared with that which is charged for the same product after having gone through a slight distillation process, sufficient to make it saleable for street-paving purposes.

A tar macadam road for general purposes is about as durable, efficient, and economical as any street paving known to-day. It is purely a matter of opinion of the various engineers as to the superiority of vitrified brick or creosote block. Of course, there is no question that these are the two best pavements known; but they are only recommended for the principal business streets and heavy traffic thoroughfares of the cities. The paving of the remainder of the streets must be with a less expensive material; and nothing better than tar macadam can be recommended for this purpose.

The advent of the automobile in such large numbers has demonstrated the fact that something must substitute the common macadam road; for the rapid passage of the machines, with their large rubber tyres, forms a suction which draws from the interstices the dust and small stones which blow away from the road, leaving the stone free and ready to be jarred loose by contact with horses' shoes and steel-tyred vehicles. Thus the road becomes frayed and very soon rutted.

The tar macadam road is the one that will stand up under these conditions—a very evident fact when the city of Duluth invest $10,300 in a portable mixing plant, and consider no other street pavement. In fact, you do not have to go any farther than the city of Milwaukee for a demonstration of this fact. The steepest grade on Winconsin Street is tar macadam. I was advised by an engineer familiar with this particular piece of work that it was laid after careful consideration; and that the reasons for laying it were practically protection to the teams which are constantly passing up and down the hill. There is just sufficient rough surface to give a horse good purchase; and while the road is smooth enough for all purposes, it is rough enough not to allow sleet and ice to glaze it over, as in the case of the asphalte to the east and west of it. Farwell Avenue is another good example of a tar macadam street. The heaviest teaming in the city goes north over this thoroughfare, yet after being down a number of years it is in almost perfect condition. The point which I wish to emphasize is this: In the face of this possible market for our product, should we be content to sell our tar from 2 c. to 2½ c. per gallon, and see the same product return to our cities sold at 8 c. per gallon?

The manufacturer to whom we sell this tar simply draws it off into a still, heats it to a temperature of approximately 445° Fahr., at which point a sufficient quantity of the lighter oils has been drawn off, for which the manufacturer receives from 7 c. to 15 c. per gallon, according to whether it is disposed of in barrels or tank lots. The tar is drawn off, barrelled and given a fancy name, with an attractive label, then sold for street paving purposes at prices ranging from 6 c. to 8 c. per gallon. Now, would it not be possible for small cities to divide themselves into groups, selecting a central location at which a tar plant could be erected—a still of not less than 4000 barrels per annum capacity—the expenses to be borne jointly by the group of cities interested, and the price to be paid to each company for their tar to be governed by the sales of the finished products? The tar plant itself need do nothing more than pay its own operating expenses and interest and depreciation charges; the profits belonging to the companies producing the bye-product. Being interested to this extent, we should be more energetic than we are in securing the construction of tar macadam roads in our cities and county highways.

I find that authorities vary considerably as to the proper construction of such roads; but I can speak from personal observation that the following, while it may not be the best, will always be a satisfactory road: Excavation in ordinary clay soil should be about 6 to 8 inches, and on this should be laid a broken stone or concrete base if desired, rolled with a 10 to 15 ton roller. The next stratum is composed of crushed rock not less than ¾ inch to 1½ inches (ring test); the same having been thoroughly heated to remove every particle of moisture. The preparation of the rock is as follows: It is first spread out on a mixed board 12 feet by 15 feet square, and crude tar, which has been heated to about 180° Fahr., is poured over it. The batch is then turned over until every particle of the stone is coated with tar, which can be done in the mixing-machines used for concrete. This is placed on the road and rolled, and it then becomes firmly cemented; the tar practically filling the interstices. The third stratum or finishing surface is composed of granite or limestone screenings, mixed with a sufficient amount of prepared tar to cause the particles to adhere closely to one another. This, in turn, is thoroughly rolled and left to stand for 48 hours. Teaming may then be allowed to go over the road.

In such a road as this, horses' shoes and steel-tyred vehicles will leave a slight impression; but the next passing vehicle will press this out. The road is absolutely dust and water proof, and cannot be torn loose or frayed by the swift passage of automobiles; and when we find that such a road can be constructed at an average cost of $1.20 per square yard, we should all take sufficient interest in our cities to bring this before the county or city Road Commissioners. The manufacturers who make a speciality of preparing this tar for macadam building will tell you that raw tar should never be used in road construction. Their point is naturally well taken; but from the data I have at hand, and from engineers with whom I have conversed on the subject, I gather that crude tar is just as serviceable in the base as the prepared tar, but under no conditions can the crude tar be used for surfacing.

The purpose of this paper is not to instruct or advise as to the construction of tar macadam road, but, if possible, to direct attention towards a tar market which will at least show as favourable results as the balance of our mercantile ledger accounts. We have all been too ready to let the two or three contracting firms dictate a price to us; and I feel very certain that if we will simply hold together and wake up to the fact that we are producing an article for which these companies must pay us, we can make the tar-well a source of revenue equal to its worth.

## PURIFYING POOR GAS FOR USE IN ENGINES.

In nearly all gas-engines worked with poor gas made from lean coal or gas coke, it is found that, whatever may be the kind of producer used and washing and purifying apparatus employed to retain the dust and tar, the valves of the engine become coated with a tarry deposit which makes frequent cleaning necessary. Moreover the tar accumulates in the cylinder in such quantities as to cement the segments. Coke washers, scrubbers, and centrifugal fans with injection of water, are absolutely insufficient to deal with this kind of tar, which is usually very thick, and perfectly solid at the ordinary temperature. Such purifiers cannot be regarded as anything more than roughing apparatus. There always escapes a little tar, which causes the inconvenience in question; and the provision of a remedy is the object of a French patent lately taken out by M. Chevalet.

In order to retain the tar, purification of the gas is completed in a washer; but instead of being supplied with water it is fed with heavy oil, obtained from the distillation of tar. Creosote, whether or not freed from naphthalene, or anthracene oil can be utilized; both having the property of dissolving tar or pitch. Anthracene oil is to be preferred, the boiling-point of which is from 250°C. (482° Fahr.) to 400°C. (752° Fahr.), because creosote oils are slightly acid, and there is danger of the cylinder being attacked if they happen to enter it. The washer may be a coke column, a Kirkham or other mechanical washer, a centrifugal fan with injection of oil, a surface washer containing wood shavings or chips, a Chevalet condensing washer, or any other system. According to the type of washer employed, the oil is either introduced all at once, as in a mechanical washer, or in a continuous current, as in a coke column or columnar washer; the oil flowing at the base being pumped to the top. The same oil is utilized until, by suitable tests, it is found that it cannot dissolve tar.

This invention utilizes the dissolving properties of the oils specified in relation to tar and pitch. This property is as follows: If a current of gas, whether or not containing particles of tar, is caused to impinge against surfaces coated with lubricating oil, these particles are retained on the surface of the oil; but there is merely adhesion of tar dust and oil, and not dissolution of tar in oil. This distinction is important. In fact, if the washers are bathed with mineral lubricating oil, tar constantly reaches the engine valves. Experiments were made especially with a Chevalet condenser-washer, which was found to be quite useless in retaining tar when supplied with petroleum or good mineral lubricating oil; whereas when anthracene oil was employed, no trace of tar was found in the gas. Another advantage due to the employment of creosote or anthracene oils is a greater calorific power of the gas. In fact, commercial creosote or anthracene oils often contain a certain amount of naphthalene, which the gas absorbs in the washer, and is thus carburetted.

This method of removing tar is not only applicable to engines, but in all cases where producer gas quite free from tar is required. The creosote and anthracene oils have been specified on account of their efficacy and their cheapness; but the invention includes all oils obtained from the distillation of coal tar boiling at above 150° C. (300° Fahr.).

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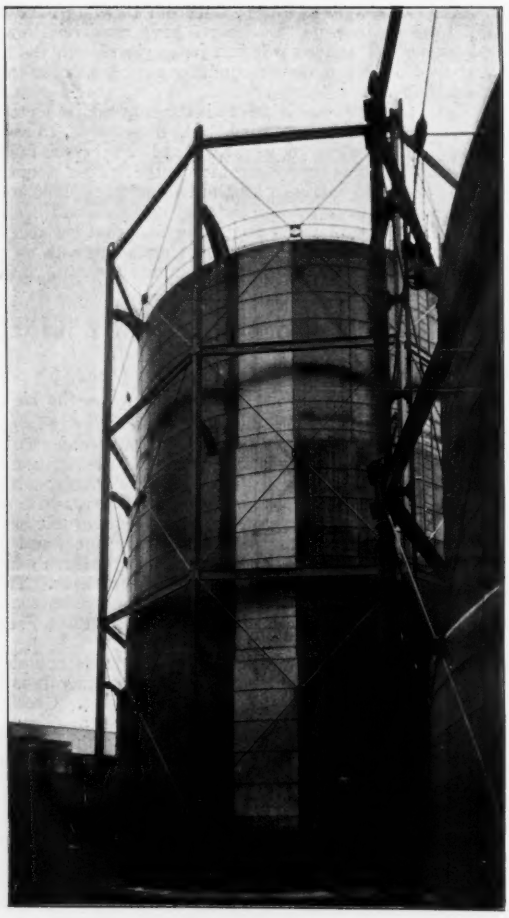
As recorded in the notice of the half-yearly meeting of the Richmond (Surrey) Gas Company which appears elsewhere, Mr. Thomas May, the Engineer and Secretary, has been presented with a silver tray and other articles, to the value of 100 guineas, on the completion of twenty-five years' service with the Company.

## A NEW GASHOLDER AT GREENHITHE.

The erection has just been completed by Messrs. Willey and Co., of London and Exeter, of a three lift gasholder, of a total capacity of 72,000 cubic feet, for the Northfleet and Greenhithe Gas Company, in an existing tank of 43 feet diameter by 15 ft. 6 in. deep. To gain additional storage capacity, the tank was deepened by a steel ring 4 ft. 6 in. deep, jointed to the existing coping—thus doubling the capacity.

The ceremony of turning on the gas was performed by Mr. Harry Keep, the Chairman of the Gas Company, on the 10th ult., in the presence of Mr. Arthur Glover and Mr. W. A. Plunkett (Directors), Mr. C. Foster Veevers, the Secretary and Manager, and Mr. James Dougall, the London Manager of the Contractors.



After the opening ceremony, Mr. Dougall entertained the Chairman and other gentlemen to a lunch, during which the Chairman spoke very highly of the way in which the work had been performed—praising the efficiency shown throughout by Messrs. Willey and Co., and coupling with a toast of "The Contractors" the name of Mr. Dougall, who responded in a speech wishing prosperity to the Gas Company in general and to Mr. Keep and Mr. Veevers in particular.

The accompanying photograph (by Messrs. Daines Bros., of Gravesend) shows the holder on the completion of the work and after it had been inflated. It will be noticed that, owing to very cramped site, the work had to be performed under exceptional difficulties.

## AIR-LIFT PUMPING PLANT AT AURORA (ILL.).

The water supply for Aurora (Ill.) is obtained from four deep wells on the bank of the Fox River, about two miles north of the business section. These wells are from 2236 to 2440 feet deep, and 8 to 12 inches in diameter at the surface; their size being stepped-down to 5 and 6 inches at the bottom. They were all driven through alternating layers of shale and sandstone, with occasional strata of limestone. In order to exclude surface water, each well is cased down to the rock with iron pipe. The wells would flow naturally to a certain extent; but, as the requirements are much greater than this flow, an air-lift system has been installed to supply the difference. The city has a population of 30,000, of which it is estimated that three-fourths take water from the distribution system. Last year, the average daily quantity of water pumped from the wells was 1,585,040 gallons.

According to some particulars in "Engineering Record," the air-lift system lowers the water level in the wells so that the average actual lift is about 48 feet. A 2-inch pipe extends down each well to a depth of 230 feet, giving a submergence of 182 feet with the average head. The water raised by the air-lifts is discharged into a 1,300,000-gallon reservoir near the pumping-station. Two compressors furnish power to operate the lifts. One of these, installed in 1902, has a cross-compound condensing steam end fitted with Corliss valves, and a duplex single-stage air end. It has air-valves of the poppet type, and a rated daily capacity of 1100 cubic feet of free air per minute at 75 lbs. pressure. This compressor was in continuous operation for six years without reserve equipment, and without seriously interrupting the water supply of the city at any time during this period. The second compressor has been placed in service only recently to relieve the one which has been in continual use. Since then the older one has been held in reserve in case of accident.

The larger compressor has a cross-compound condensing steam end, and also a cross-compound air end. Between the high-pressure and low-pressure steam cylinders is an interheater, and the discharge from the low-pressure air cylinder is passed through an intercooler before being admitted to the high-pressure air cylinder. Both the interheater and the intercooler are placed beneath the floor of the engine-room. The valves on the steam end and those on the air intake are of the Corliss type. The air discharge-valves are of the sensitive poppet type.

The air is drawn through a pipe that extends above the roof of the pumping-station, and is discharged into a vertical receiver, from which 2-inch pipes lead to each of the wells. At 80 revolutions per minute, the large compressor has a capacity of 2000 feet of free air per minute against a pressure of 115 lbs. This output is greater than is necessary to raise enough water to meet the present requirements of the city; so the machine is operated only 16 to 18 hours a day at 48 revolutions per minute, and against a pressure of 78 lbs.

Three pumps in the station are arranged to discharge into a stand-pipe on a neighbouring hill, or directly into the mains. The pipe is 152 feet high, 18 feet in diameter, and has a capacity of 287,000 gallons. In case of fire, a valve on the discharge-pipe leading to the stand-pipe is closed by means of a small engine in the station, so that the pumps may deliver to the mains direct. Two of the pumps are of the Deane duplex type, with a rated daily capacity of 1½ million gallons apiece, and the third is a Nordberg triple-expansion unit, with a rated daily capacity of 6 million gallons.

## SATURATION OF EARTH DAMS.

Many years ago, Mr. Desmond FitzGerald made some measurements of the level of the ground water in one of the earth dams of the Boston Water-Works; and at a later date, the Committee who reported on the earth dam originally intended as a part of the new Croton dam made similar investigations at a number of dams. Beyond the information furnished by these measurements, very little has been known about the subject; and the Bombay Government recently undertook to make further investigations, in order to ascertain the extent of the saturation in the high embankments of the storage-tanks that are a feature of water-supply works in that province. The following particulars in regard to the matter are given in "Engineering Record."

In the Matoba tank, the dam was constructed of clayey material throughout, faced only with a thin moorum skin. Five pipes perforated at 1-foot intervals were sunk vertically into the bank, and the levels recorded to which water rose in the pipes. A line connecting the highest levels indicated the line of saturation. Saturation attained its maximum on the up-stream face, and also towards the base of the down-stream face, three weeks after the highest rise of water in the tank. Towards the top of the down-stream face, however, saturation proceeded more slowly, reaching the maximum 35 days later, by which time the water level had fallen 2·7 feet. It is recorded also that in the following year it took 62 days for the line of saturation to be reached; indicating probably that a year's further consolidation of the bank had improved its impermeability. At the period of highest saturation, there was only 2 ft. 6 in. depth of dry material near the outer toe, and on one occasion a slip occurred there.

The Unkal tank dam was constructed with selected material throughout; care being taken to have a good draining composition in the down-stream section. The central part of the dam has the most clay in its composition, while the down-stream section has the least. The line of saturation accordingly takes a special course. In the first section it begins with what would be a normal slope, but is deflected upwards as it approaches the line of junction with the middle section. This is obviously because the middle section containing the most clay is the most open to saturation. In the middle section itself the line approaches the horizontal in the first half, but in the second half dips to the junction with the third section. In the third section, in consequence of good drainage, the line of saturation keeps quite near the base. The general results of these experiments were summed up as follows: (1) Clay banks are more completely saturated than well drained banks. (2) Clay banks are more slowly saturated and part more slowly with their water of saturation. (3) In high banks it is unsafe to have nothing but clayey material—a down-stream section of well-drained material being essential.

# CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

## Electric Facilities Bill—Income Tax Assessment.

SIR,—I hear that there is some possibility of the Electric Facilities Bill coming before a Parliamentary Committee; when there will be an opportunity of showing the hardships that exist where gas undertakings are rated to help to make up the deficiency which arises when electricity is sold below cost price by municipal bodies. As this opportunity will be discussed at the next meeting of the Gas Companies Protection Association, it is desirable that those cognizant of instances of this practice should communicate without delay with the Secretary of the Association, Mr. F. E. Cooper, 5, Victoria Street, Westminster.

At the same meeting will also be considered the aggressive attitude lately taken up by some of the collectors in respect of the allowances for depreciation which have necessarily to be charged against revenue to maintain the capital value of the undertaking. It is desirable herein also that the Secretary be informed of any claims which may have been made in that direction.

*Palace Chambers, Westminster, S.W., Sept. 4, 1909.*

HY. E. JONES, Chairman,
Gas Companies Protection Association.

**Passage of Gas through Orifices.**—A correspondent writes: "I shall be glad if any of your readers can tell me if there is a formula for the quantity of air or gas which will pass through a given sized hole at different pressures—say, from 2 to 54 inches water gauge—and say whether the depth of hole has a bearing upon this, first in relation to nipples and secondly to flat plates, and what percentage should be allowed for them hot."

# REGISTER OF PATENTS.

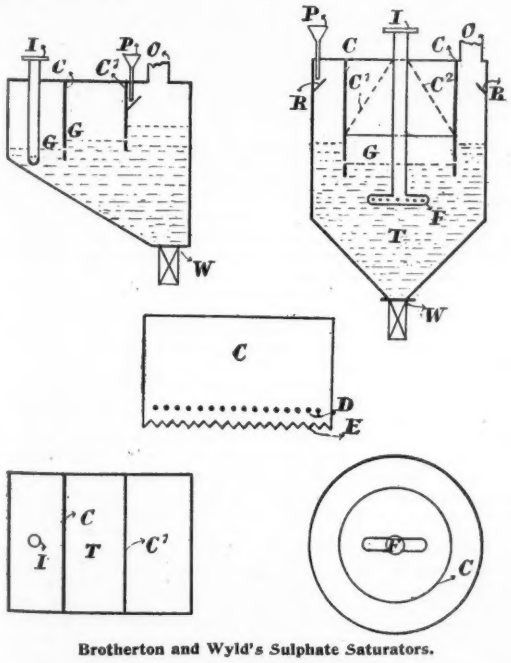
## Sulphate of Ammonia Saturator.

BROTHERTON, E. A., and WYLD, W., of Leeds.

No. 14,349; July 7, 1908.

In the usual type of vessel used for the manufacture of sulphate of ammonia, it has been the general custom, the patentees point out, to distribute the vapours by means of a perforated pipe fixed within the vessel, or by fixing the "bubbling" pipe outside the shell with communications at intervals through the saturator walls. Their invention "accomplishes the work of thoroughly washing the vapours in a vessel of simple construction; and as the gases are delivered into the body of the liquor in the saturator, less local alkalinity takes place—deposits of hard salts thus being prevented."

Their saturator consists of an enclosed vessel having an inclined bottom and one or more depending partitions serrated or/and perforated at their lower extremities. Gas inlet and outlet pipes communicate with the interior; and a liquid distributing trough is placed in the compartment nearest the gas-outlet. The ammoniacal and other vapours as they travel towards the outlet consequently have to pass through a liquid increasing in acidity, and so are "thoroughly washed free from ammonia."




**Brotherton and Wyld's Sulphate Saturators.**

The gas-inlet I is allowed to dip into the contents of the vessel, and may be elongated in the form of a "tee" or "rose" as at F. From the top of the vessel depend one or more partitions CC¹ perforated or/and serrated at their lower extremities as at D E. These partitions are of such a depth as to secure the requisite seal in the liquid; the acid being delivered by the pipe P into the trough R for better distribution within the tank. If more than one partition is employed, the dip of each succeeding partition towards the outlet is higher than the preceding one.

It has, however, been found that in some cases it is not necessary to use more than one partition when sufficiently immersed in the liquid; but to prevent any absorbable vapours leaving the vessel, two or more partitions C¹ may be introduced of different depths—the absorbable vapours thus on passing through the acid from one side of the partitions to the other being further washed before leaving the vessel by the outlet pipe O.

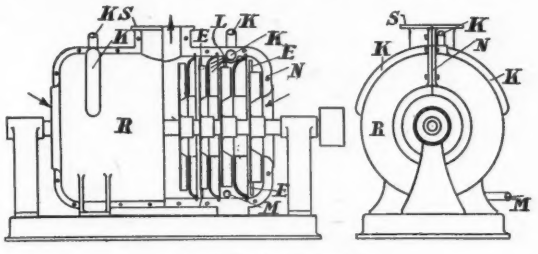
In a cylindrical arrangement of the vessel, the upper portion of the partition C may be dome-shaped, as shown by dotted lines C¹¹; but in either case, by the tank having an inclined bottom converging to an outlet pipe W, provided with a valve, the manufactured product may be readily removed from the interior of the tank.

## Turbine Exhausters.

HODGES, R. J., of Devonshire Square, E.C.

No. 18,148; Aug. 29, 1908.

This invention relates to that class of turbine or exhauster blower in which the medium operated upon undergoes successive compressions. It has for its object a form of construction whereby "a much higher degree of efficiency is obtained than hitherto, with greatly reduced speed of revolution, better facility for cleaning the interior, and means for cooling and cleansing the medium during compression."




**Hodges' Turbine Exhauster.**

In the illustration a front elevation is shown, having part of one-half of the case removed to show the internal parts, an end elevation, and a view of four of the rotor wheels placed one over the other.

The four rotor wheels increase in diameter, but decrease in volumetric capacity, successively in the direction of compression; the curvature of the blades also increasing on each wheel in succession. In addition to the curved blades there are radial blades E of propeller form, which project beyond the periphery of the rotor discs; or, instead of attaching the blades, they may be formed by notching or stamping the rotor wheel discs, which are for that purpose made of corresponding larger diameter. The object of the additional blades is to relieve the pressure at the periphery of the rotor wheels and propel the air with increased velocity into the division plate annulus—"thus greatly increasing the efficiency."

Between each of the rotor wheels are dished annular division plates (with curved guide blades on their hollow sides) made shallower in succession in the direction of compression in order to reduce their capacity annulus successively. The object of increasing the curvature of these guide blades successively is to give a more gradual direction to the gas flow as it becomes more densely compressed.

In order to cleanse or cool the gases during compression, water-ducts K are formed in the upper portion of the casing walls. The ducts are perforated by numerous holes, forming nozzles L, and are so arranged that jets of water traverse the gas issuing from the periphery of the rotor wheels, and then impinge against the division plates—thus forming a spray in the guide vane annulus, after which it escapes by drains at the bottom of the case at M. By this arrangement, the water-jets are prevented from striking the rotor wheels—thereby obviating shock, and economizing the driving power.

To facilitate cleaning the machine when used for dusty or tar-laden gases, or the like, the outer casing is formed in two halves bolted together at the longitudinal vertical joint at N, and the driving shaft, which carries the rotor wheels, is supported by separate pedestals from the bed plate. This arrangement allows the half of the casing R, after unbolting at the joint N and outlet pipe flange S, to be removed without disturbing the adjustment of the rotor wheels, driving mechanism, or pipes.

## Gas-Fired Furnaces.

BARNSLEY, P. G., of Netherton, near Dudley.

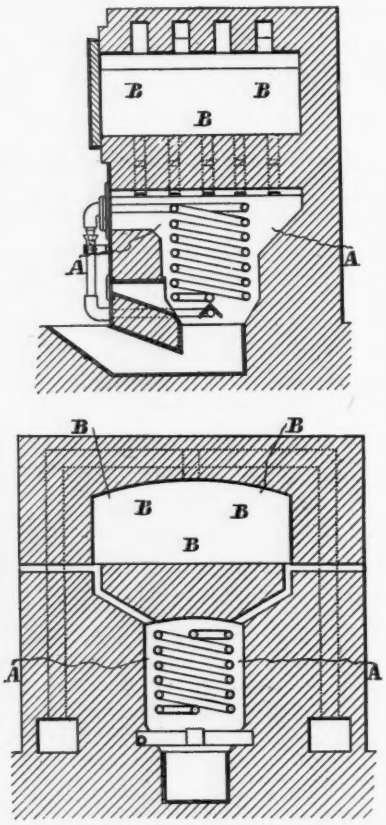
No. 19,018; Sept. 10, 1908.

This invention relates to gas-heating furnaces, such as are used for annealing, case-hardening, and such-like purposes, with the object of providing a self-contained furnace directly fired from a producer, and particularly adapted for the equal heating of articles placed in any position therein.

The example shown is that of a furnace with producer A (of ordinary form) directly beneath the furnace B, so that the top of the producer and the floor of the furnace are the same. The producer (besides having the usual provisions for charging and for blowing or feeding with air and steam) is provided with a coil or battery of pipes in the interior running around the walls. These, supplied with water, serve for supplying steam for the usual steam injector, so that a separate steam generator is not a necessity. From the upper part of the producer gas-flues are provided, which, in the example shown, incline upwards and enter the furnace at the sides of the floor. It is preferred to employ a number of flues, arranged along the side edges of the base of the furnace so as to effect the complete and equal heating of the

furnace. At the points where the flues pass up through the floor of the furnace, air inlets are arranged to pass straight into the flues from the outside, so that the gases distilled off from fuel in the producer are burnt at their entry into the furnace.

It has been previously known to arrange in a furnace in which the combustion chamber is over the producer for the gas and air to meet at once on their entry into the chamber. In the example shown, the products of combustion pass out of the furnace through flues alternately taken down the right and left hand walls of the furnace to a common flue at the base so that a portion of the heat is utilized. Such an arrangement of furnace over the producer is of great advantage, as it economizes floor-space; and (more important still) it enables the heat generated in the producer to assist in heating the furnace, as the portion of the producer most exposed—viz., the roof—is the floor of the furnace.




**Barnsley's Gas-Fired Furnaces.**

The distribution of the gas-flues shown is said to effect the even heating of the whole furnace; but where a larger furnace is employed more numerous flues may be used, as "it is a great advantage to have practically every part of the furnace at the same heat."

The steam-raising coil in the producer is fed from a tank at a suitable head, and from the upper part of the coil the steam is led to an injector blowing into the producer. This is a very convenient provision for the generation of steam to feed the producer without the necessity of outside plants, thereby enabling the plant to be self-contained. But, in some cases, instead of the pipe coil, a passage may be formed round the walls of the producer closely adjacent to the interior so as to form an encircling or spiral passage-way, and the water may be fed into this for raising steam in a similar manner.

In the example illustrated with a control on the injector as the furnace heats up, more steam can be introduced until a gas very rich in hydrogen is given off at quite a low temperature in the producer; and this, owing to the high calorific value upon combustion at the furnace, gives a very efficient heating of the latter.

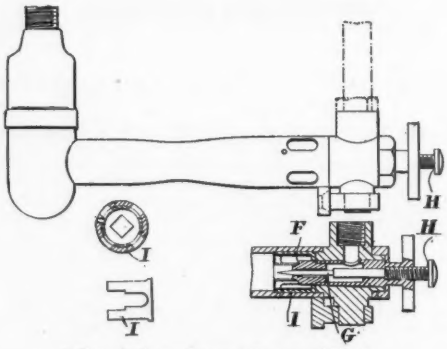
## Incandescent Gas-Burners.

COLBRAN, J. B., of Chiswell Street, E.C.

No. 1048; Jan. 15, 1909.

This invention relates to the burners of incandescent gas-lamps of the vertical or overhanging inverted type, provided with means for regulating the supplies of gas and air from outside the lantern. It consists in the usual nozzle to which the burner is attached, a bunsen tube, and a bracket to which the gallery or other part of the frame of the lamp is attached. Carried by the bracket and located exterior to the lamp is the gas-tap, in which is arranged a hollow plug retained in position by a cap which screws on to the body of the gas-tap and terminating in a nozzle F for the supply of gas controlled by the needle-valve G, operated by the screwed head and stem H. To regulate the passage of air through the openings of the bunsen tube, there is arranged therein, and carried by the nozzle of the plug, a correspondingly divided valve, shutter, or baffle I, provided with a square opening to fit on the nozzle of the gas-plug which at its outer end is provided with any suitable arrangement of handle.

To effect the regulation of the supply of air and gas to the bunsen




**Colbran's Incandescent Burner Adjuster.**

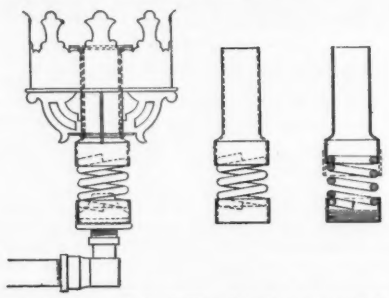
tube, it is only necessary to operate the handle and the screw stem H of the needle-valve, which in the section is shown cutting-off the supply of gas—the travel of the valve or baffle I being limited by a stop which engages in an extended or wider part of one of the slots of the valve.

## Anti-Vibration Incandescent Gas-Burner.

OULTON, J., and NEWHOUSE, W. A., of Bradford.

No. 6700; March 20, 1909.

Instead of forming the ordinary air inlets in the bunsen burner for incandescent mantles, the patentees transversely divide the mixing-tube of the burner below the part supporting the mantle and gallery, and interpose a vertical open spiral or helical spring concentric with the gas orifice in the place of the ordinary inlets.



**Oulton and Newhouse's Anti-Vibration Incandescent Burner.**

The combustion chamber or mixing-tube of the bunsen is transversely divided, and the centre portion (containing the ordinary air inlets) is removed, and an open spiral or helical spring is concentrically interposed between the upper and lower portions. The spring is made separate and connected to the upper and lower portions of the combustion chamber or mixing-tube; or the spring may be made to fit tightly into the ends of the upper and lower portions of the tube by compressing together the spirals at each end of the spring. This latter method "enables the parts to be readily taken from together to be cleaned, besides forming a secure and inexpensive joint."

To regulate the air passing through the air-inlet passage of the mixing-tube, a sliding piece may be fitted telescopically on the lower or upper portions of the tube, and secured in position in any convenient manner.

## Gas-Retort Lids.

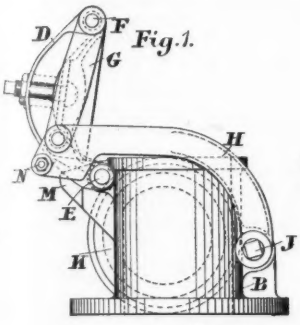
ROBERT DEMPSTER AND SONS, LIMITED, and TOOGOOD, H. J., of Elland.

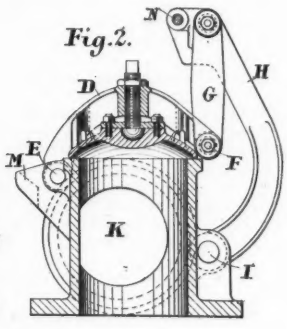
No. 20,850; Oct. 3, 1908.

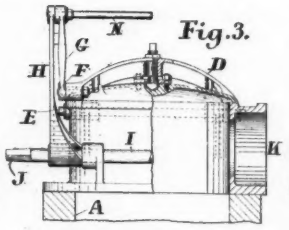
This invention relating to self-sealing lids of gas-retorts, although especially applicable to the top and bottom lids of vertical retorts, also applies to other forms of retorts.

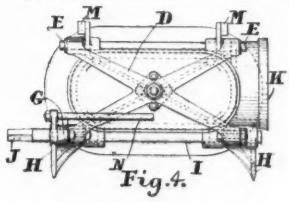
As is well known, the patentees remark, the opening of the ordinary self-sealing lid, as applied to horizontal and inclined gas-retorts, requires three distinct operations—namely, the lid is first unsealed by operating a handle, next the catch is removed from the end of the crossbar, and then the lid is swung horizontally on its hinges. To close the lid, these three operations are reversed. When applying such lids to vertical retorts, certain modifications become necessary. For example, in the case of the bottom mouthpiece lid, which must sustain the whole weight of the charge, and at the same time remain gas-tight, the lid, instead of swinging horizontally on its hinge, falls when opened into a vertical or nearly vertical position, and, consequently, requires some means to ensure that the lid is held sufficiently open to permit the exit of coke without hindrance. The lid has also to be raised against gravity when closing. As all the operations of actuating the lid must be performed from the outside of the bench—say 8 feet away—there is a difficulty in arranging gearing to perform the required movements for each of a large number of mouthpieces arranged in close formation along the retort-bench. It has been proposed to fit each lid with two rocking-shafts protruding to the front of the bench; one shaft operating the throw-over catch and the sealing eccentric which are present in the ordinary self-sealing lid, while the other shaft effects the actual raising and lowering of the lid—a separate attachment being provided to secure the lid in the full open position during the discharge of the coke.

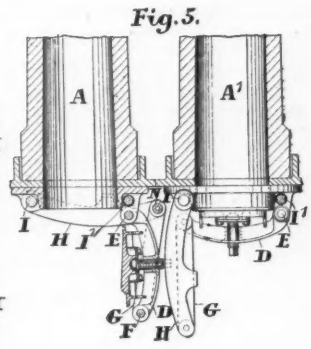
According to this invention, a system of toggle-jointed levers is arranged to work in conjunction with the hinged crossbar of each lid.

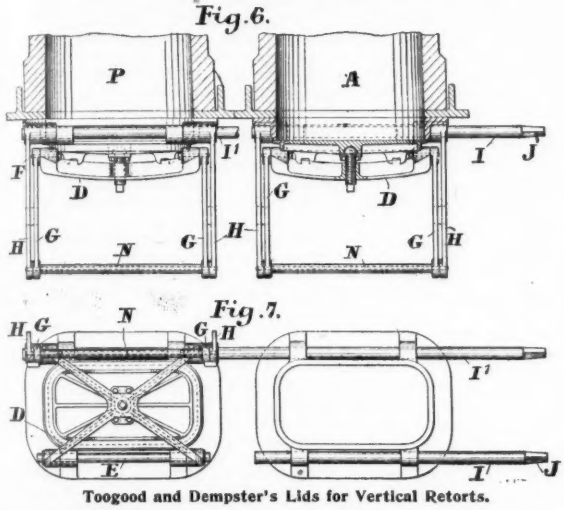



**Toogood and Dempster's Lids for Vertical Retorts.**

The sealing eccentric and throw-over catch are thus dispensed with, as a single movement of the levers in one direction unseals and opens the lid, while a single movement in the opposite direction closes and seals the lid—the usual three operations being thus resolved into one. Also, as is well known, toggle-jointed levers are capable of exerting great pressure at the moment of their centres coming into line, so that by this means it is possible to obtain the maximum sealing pressure of the lid against the mouthpiece, so as to render it gas-tight even against relatively high pressures of gas, and, in the case of bottom lids, against the heavy weight of the charge in the retort.

Fig. 1 is a front elevation of the top mouthpiece of a retort with the lid open. Fig. 2 is a vertical section of the mouthpiece with the lid closed and sealed. Fig. 3 is a side elevation, partly in section. Fig. 4 is a plan. Fig. 5 is a vertical section of two bottom mouthpieces in the same row, the lid (in section) of the retort A being open, and that of the retort $A^1$ closed. Fig. 6 is a vertical section at right angles to fig. 5, through two bottom mouthpieces opposite one another in adjacent rows—both lids being closed. Fig. 7 is an inverted plan of the mouthpieces in fig. 6, with the lid of the retort in the front row removed.

The retort lid crossbar D is hinged on the stud or pin E and connected at F to the toggle-lever arm G. The other toggle-lever arm H is secured upon a rocking-shaft I, the end J of which is adapted to be engaged by a lever not shown. This rocking-shaft may, however, be worked by a worm, rack, screw, or any other desirable means. K is the ordinary gas-outlet. A stop-piece M formed on the web carrying the pin E limits the movement of the crossbar D in the opening stroke. The levers G H, in duplicate, are connected by the stay-rod N.

In figs. 5, 6, and 7, the stays N may be tubular, and the lids of the retorts P in the back row are actuated by shafts $I^1$, arranged alternately with the shafts I, such shafts passing through clearance holes formed in the lugs which carry the hinge pins E of the lids of the front row.

In order to obviate any slight inequality in the action of the levers G H on opposite sides of the same lid, which may arise from torsion of the shaft I or $I^1$ between them, a single system of toggle-levers for each lid may be substituted for the duplicate system shown, and the form of the crossbar D may be modified. Instead of the rocking-shaft I, a horizontal handle, or an upright (fixed or detachable) handle may be employed to actuate the toggle-jointed levers. The lever works on a stud, and is provided with a lug to prevent the lever passing beyond the required distance—that is, a predetermined small distance beyond its dead-centre or position of maximum pressure so as to hold the levers in position. Set-screws may be adjusted to limit the amount of play between the lid and crossbar when open; these screws being clear of the lid when closed.

## Gas-Producers.

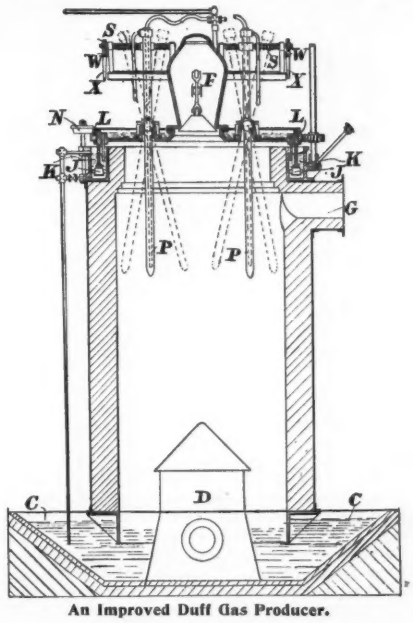
DUFF, A. B., of Pittsburg, U.S.A., and the GAS-POWER & BYE-PRODUCTS COMPANY, LIMITED, of Glasgow.

No. 7780; April 1, 1909.

This invention relates to gas producers with water-cooled and water-luted revolving tops and water-cooled adjustable pokers. The object of this invention is to provide a combination and arrangement of parts which will ensure a thorough disturbance of the top layer of fuel—thus preventing clinkering and caking of the fuel, and ensuring its complete gasification. The producer is particularly suitable for ammonia recovery purposes.

The firebrick-lined casing and the blower are of the usual construction and stationary. The top (water-cooled and water-luted) is carried by a flange depending from its under side and bearing on rollers in the lute, so that rotation is permitted, while the bearings are kept free from dust or grit. The rotation of the top is effected through gearing from any source of power, while a gas-tight joint between the top and the casing is obtained by the flange in the water-lute. Water-cooled pokers are pivoted at or near their centres in the top. Their lower ends project into the upper parts of the fuel, and their upper ends each engage a nut working on a rotatable screwed spindle, so that the lower ends of the pokers may be moved to and from the sides of the casing, or adjusted in position relative to the sides, while also being carried round with the revolving top. This ensures the breaking-up of any particular part of the upper layer of fuel.

As shown, the producer consists of the usual firebrick-lined circular casing carried on angle-iron beams extending across the water-lute trough C from which the ashes are withdrawn, and from which extends up the usual blower grate D. In the centre of the cover or top of the producer is the usual feed-hopper F; and the gas produced passes off by the outlet G. From the under side of the top there projects an annular flange, the lower edge of which runs on rollers J in the bottom of an annular channel K formed around the upper end of the producer casing. On the channel being filled with water, the top is luted—making an effectual gas-tight joint between the casing and the top.




**An Improved Duff Gas Producer.**

The roller bearings being in the water-lute are kept free from dust or grit, while the lute itself, being beyond the producer wall, is not subjected to great heat. On the outer edge of the top there is a toothed ring L gearing with a pinion on a shaft driven through gearing (not shown) from any source of power, so that on rotation of the shaft the top is made to revolve on the rollers J. Displacement of the top is prevented by guide-rollers N. Pokers P have formed on them, near the centre of their length, trunnions carried in bearings formed or fixed in the top so that their lower ends project into the upper layer of the fuel within the producer, and the upper end of each poker engages in a slot in a nut on a screwed spindle S carried in bearings on the upper ends of standards extending up from brackets secured to the hopper. Each spindle has on it a wormwheel gearing with a worm W on the handled spindle X, on turning which the screwed spindles are rotated, so as to adjust the position of the pokers.

The pokers are cooled by the water supplied through a swivel-jointed pipe connected, by flexible pipes, with the upper ends of the pipes dipping down within the pokers. The water overflows from the pokers on to the upper surface of the top, from which it escapes into the annular channel K from which it overflows. Thus, while the burning of the pokers and top is prevented, a constant depth of lute in the channel K is ensured.

## Manufacturing Igniting Compositions.

SCHMITZ, H., of Paris.

No. 9992; April 27, 1909.

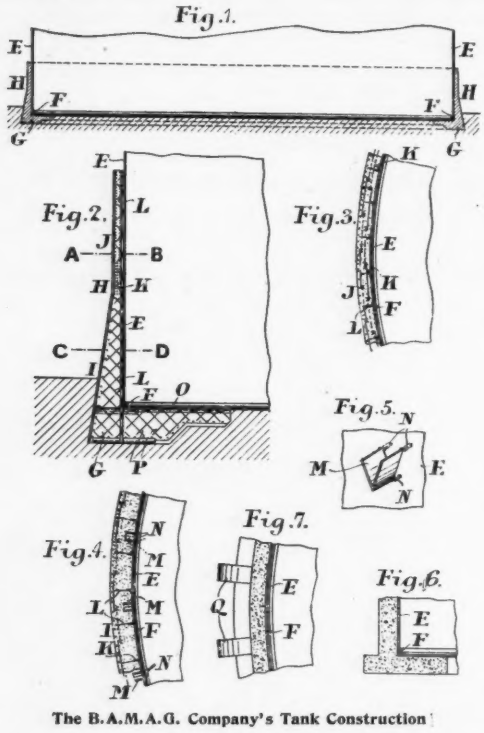
The patentee describes a process for rendering yellow phosphorus more effective as an igniting composition, consisting in producing an artificial intimate mixture of yellow phosphorus with oxygen-yielding salts before admixture with the binding and other materials, by introducing the phosphorus in the hot solution of the salts and shaking the solution with the melted phosphorus during cooling. In this way, an emulsion with the salts crystallizing out is formed, which, after discharging the water, can be used directly for the purpose in question.

## Gasholder Tanks.

KILBURN, B. E. D.; a communication from the BERLIN-ANHALTISCHE MASCHINENBAU ACTIEN-GESELLSCHAFT, of Berlin.

No. 10,071; April 28, 1909.

This invention relates to tanks of large diameter—more particularly those intended for liquid or fluids under pressure. Hitherto, the patentees point out, the walls of tanks have been formed of comparatively thick sheet metal, to prevent changes in form consequent on "the severe strains caused by the pressure of the fluid." For this reason, "the use of large tanks having sheet-iron walls is limited, seeing that after a certain thickness the sheet-iron plates cannot satisfactorily be joined and riveted." The inventors' object is "to reduce the thickness of the walls by the particular formation of the lower part of such tanks, thereby enabling the construction of tanks of very large diameter to be readily accomplished."




The B.A.M.A.G. Company's Tank Construction.

Accordingly, the outer cylindrical wall of the tank bears against the vertical portion of a ferro-concrete ring of angular cross section; the floor of the tank being in contact with the horizontal portion of the ring, which thus serves as a foundation or support for an annular part thereof—the strain exerted by the fluid upon this horizontal member being equal to, or greater than, the pressure exerted upon the vertical portion of the annular ring. The ferro-concrete ring, in combination with the lower edge of the tank which bears against it, may be regarded as one body formed of angular levers placed beside each other in a circle and connected together. And since the pressure of the fluid in a horizontal or outward direction tends to turn each angle lever outward about the vertex, and the vertical or downward pressure of the fluid acts in opposition to this turning movement, the horizontal arms of the angle levers are made of such dimensions that the resultant of the force acting upon them, and of the outward force acting upon the vertical arms, passes through the vertex of the angle or through the horizontal arm. An outward tilting of the angle lever is thus prevented.

In this construction of tank the sheet-iron walls may be of less thickness, seeing that in the horizontal direction they have only to take up a fraction of the pressure of the fluid, whereas they resist vertical moments of resistance in combination with the ring of ferro-concrete in contact with them. The consequence is that there are practically only tensile strains in the vertical direction in the sheet-iron walls, even in the event of any deflection occurring. The tank thus has the advantage that no separate foundation is required, seeing that the horizontal portion of the angle-ring surrounding the lower portion of the sheet-iron walls is embedded in the bottom of the tank, and serves at the same time as a foundation.

Fig. 1 is a vertical longitudinal section through the lower portion of the tank. Fig. 2 is a vertical section of the bottom part (on a larger scale). Fig. 3 is a section on the line A—B of fig. 2. Fig. 4 is a section on the line C—D. Fig. 5 is a perspective view of a member for connecting the sheet-iron walls to the angle-ring of ferro-concrete. Fig. 6 shows the edge portion of another form of tank or holder in vertical section. Fig. 7 is a horizontal section of the lower part of another modified construction of tank.

In the tank shown (which may be, by way of example, about 250 feet in diameter and about 42 feet high), the cylindrical casing E is composed of sheets which increase in thickness towards the bottom; and sheets of less thickness are joined to these sheets at the lower portion. The lower sheets of the casing are rigidly connected to the sheet-iron bottom of the gas-tank by means of comparatively light angle iron-rings F. This tank made of sheet-iron is, as it were, inserted into an angle-ring of ferro-concrete, the horizontal part G of which is embedded in the adjacent ground, and is in the form of a rigid body rigidly connected to the vertical part H of the ring by means of a suitable joint. The vertical portion of the angle-ring is likewise, up to a certain height, in the form of a rigid body I of ferro-concrete, while its upper part J consists of concrete, simply reinforced by layers or strips of iron to take up any annular tensile strain that may arise in this portion. The inner strips of iron comprise individual ring segments, the ends of which are bent, and which, without further fastening means, are placed horizontally into the mass of concrete in such a manner that they partly overlap each other. Similar iron strips are preferably also provided in the lower ring portion I and in the horizontal ring portion G.

The sheet-iron casing is connected with the vertical part of the iron concrete ring by vertical projections extending into the mass of concrete and comprising angle irons K, secured at certain intervals to the outer circumference of the casing so as to be parallel (or nearly so) with the axis of the tank, and also round-edged iron members or the like L, arranged crosswise—preferably in the lower ring portion and suitably connected to the angle irons K.

The projections extending into the concrete of the vertical portion H of the angular ring prevent the displacement of the casing in the event of its expanding, owing to the pressure of the fluid; the inner layers of iron taking up the annular tensile strains which arise, while the round-edged irons L, placed crosswise, and the angle irons K intimately connect the concrete body with the casing to such an extent that they jointly take up the bending strain in the radial planes.

To ensure a safe connection between the casing and the concrete ring, additional angle members are preferably secured between the angle irons K, the points of which are directed downward, as in fig. 5. These angle pieces, when embedded in the concrete, resist deflection, and, owing to their special arrangement, prevent the formation of hollow spaces as the concrete is being rammed down.

The angle members M are preferably of V cross section and provided with arms N at their inner ends, whereby they are safely fastened to the casing. The arms pass through corresponding holes in the casing, and their projecting ends are riveted over.

It is preferable to secure upon the under side of the sheet-iron bottom of the tank radial angle irons O extending to the outer circumference of the angle ring, round-edged irons P again being fixed to the latter—projecting into the concrete of the horizontal portion G of the ring, which, jointly with the bottom sheet, take up the tensile strains.

The foot of the angle ring of concrete H I may also be T-shaped (as in fig. 6) if desired; and, further, the horizontal portion G may be provided on its outer surface at certain intervals with projections Q, which may be formed as buttresses, as in fig. 7.

## APPLICATIONS FOR LETTERS PATENT.

19,357.—KRAUSE, E. H. H., "Gas-furnaces." Aug. 23.
19,382.—THAU, A., "Removal of graphite from the ascension-pipes in coke and gas works." Aug. 23.
19,383.—WAKEFIELD, C. C., "Acetylene generators." Aug. 23.
19,419.—BRÖKER, H., "Gas-furnaces." Aug. 24.
19,430.—RESTLER, J. W., "Valves for gas, or other fluids. Aug. 24.
19,435.—EDGAR, W., "Combination gas-fire tap and governor." Aug. 24.
19,444.—NUNES, G. J., "Generating gas for vehicles." Aug. 24.
19,471.—SERVICE, J., "Cover for chimneys used in incandescent gas lighting." Aug. 25.
19,489.—PEEBLES, W. C., "Operating coin-prepayment mechanism from a distance." Aug. 25.
19,513.—WRIGHT, G. B., "Regenerative furnaces." Aug. 25.
19,534.—FRANK, A., "Meters." Aug. 25.
19,541.—JOLY, C., "Mantles." Aug. 25.
19,552.—TESKE, C., "Leak-detectors for water-pipes and the like." Aug. 25.
19,553.—BLACKBURN, R. W., "Inverted globe holders." Aug. 25.
19,567.—BLAKEY, J. W. & A. G., "Incandescent burners." Aug. 26.
19,571.—BLOORE, A. & J., "Incandescent burners." Aug. 26.
19,639.—CAMBRIDGE, A. S., "Generating gas." Aug. 27.
19,653.—DAVIES, W. W., "Taps or valves." Aug. 27.
19,726.—FRANKLIN, G. M. & D., "Gas-fittings." Aug. 28.
19,736.—ETNA LIGHTING AND HEATING CO., LTD., and BEARD, W. A., "Inverted globe-holders." Aug. 28.
19,767.—KÜPPERS, C., "Measuring gases." Aug. 28.
19,775.—BOCHUM LINDENER ZUNDWAREN UND WETTERLAMPEN-FABRIK C. KOCH, "Pyrophorous lighting devices for lamps." Aug. 28.

**Gas Profits and the Rates at Batley.**—In accordance with notice, Mr. Sykes moved, at the last meeting of the Batley Town Council, a resolution to the effect that the Gas Committee should take into consideration the question of reducing the price of gas, instead of devoting the profits to the relief of the rates, as was done at present. He stated that the price of Batley's gas was 2s. 1d. per 1000 cubic feet net; and during the past ten years, no less than £35,774 profit had been derived from the gas undertaking, of which amount £32,400 had been devoted to the relief of the rates. He contended that the domestic consumers were the principal contributors to this profit; and it was they who should derive the benefit by a reduction in the price. After a lengthy discussion, the motion was defeated by eleven votes to five.

# MISCELLANEOUS NEWS.

## MELBOURNE METROPOLITAN GAS COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices in Melbourne on the 28th of July—Mr. JOHN GRICE, the Chairman, presiding.

The Directors reported that the net profits for the half year, including a balance of £2988 brought forward, amounted to £87,820; and they recommended the payment of a dividend at the rate of 5s. per share, amounting to £42,860. A sum of £25,000 had been transferred to the reserve fund, and £5000 each to the meter renewal and depreciation funds and the gas-stoves account; leaving a balance of £4960 to be carried forward.

The CHAIRMAN, in moving the adoption of the report, said the quantity of gas sold in the half year was 819,024,000 cubic feet—an increase of 62,000,000 cubic feet on the sales for the June half of 1908. The output then was 48 millions in advance of the corresponding period of 1907. The gas supplied through slot-meters—65,674,000 cubic feet (which was an increase of 19,237,000 cubic feet)—was included in these figures. The number of these meters fixed in consumers' premises on the 30th of June was 13,406, compared with 9721 on the 30th of June, 1908. There was an increase of 38 per cent. in the number of slot-meters, and of 41 per cent. in the amount of gas passing through them. The Directors were steadily and systematically extending the issue of these meters; and as several suburbs were still untouched, there was reason to think this steady increase must continue for some years. As the result of the sales of gas, and the very handsome return of £52,430 from residuals, a balance of £104,242 was carried to the net revenue account, from which the appropriations shown in the report had been made. This was the first time that any amount had been set aside as a depreciation fund for works on leasehold lands, though such a fund was contemplated by, and provided for in, the schedule of the Act of Incorporation. The reason for making this provision was that at the expiration of a short period a 21 years' lease of certain land at the West Melbourne station, on which valuable plant and buildings had been erected, would terminate; and the sum of £5000 was now being set apart for the purpose of writing-down the buildings and fixtures of the Company attached to this land. While the shareholders might be congratulated on the results of the half-year's working, it was necessary, from more than one point of view, that something should be said as to the obligations of the Company arising from the increased volume of business now being done, and from future increases that might reasonably be expected to take place, and for which they must provide in anticipation. The success of to-day was but the forerunner of to-morrow's obligations. The greater consumption of gas by the public entailed larger expenditure for the purpose of providing additional plant and machinery for coping with such increase; and, as a corollary, the greater the quantity of plant in use, the higher the total cost of upkeep. During the past half year, they had benefited materially by the plant at South Melbourne, which, being new, was doing its best work; and they must bear in mind that, notwithstanding all their provisions, they were not likely to have any further new and improved methods completed for nearly four years. Those who did not follow the enormous necessary expenditure of a company like theirs, and the length of time ahead that provision must be made for maintaining the business and providing for its growth, thought, when they saw figures showing what were called "large profits," that the Directors had a simple course in front of them. He presumed it was in consequence of these profits that the Chairman at the meeting might possibly be expected to intimate something in regard to the price of gas in the future. He certainly had not the gift of prophecy, and he was not authorized by his colleagues to do more at present than place some figures before the shareholders to allow their customers to see what call there was on the present earnings and on those of the immediate future. Their duty was to supply the city and suburbs with good gas, and to give satisfaction to their customers by attending to their wants. So much was self-evident; and they were doing their best to accomplish these objects. Each year they, as a Company, did more and more in attending to, and correcting, the defects in pipes and fittings of their clients at a heavy cost to themselves; and if they wished to give satisfaction, this would be an ever-increasing expense. They could not keep pace with the present heavy extra demand, except by laying out large sums on the manufacturing plant. An increase in the capital must, if possible, be avoided. Their capital grew very fast from the end of 1882 to the end of 1892, during which ten years the amount paid out of capital account (independently of the expenditure on plant, &c., from profits that passed through the reserve fund account) increased from £856,000 to £2,077,000—an average for those years of £122,000 per annum. Owing to the collapse, they then for years had more plant than was needed; and when the requirements, after many years, caught up to the plant, the latter had become more or less out of date. So they had had to gradually improve and reconstruct the whole works, as it was necessary in these days of competition to work with the best tools. During the 16½ years from Jan. 1, 1893, the capital expenditure showed an increase of only £72,000 in all. Since 1904, all expenditure for capital purposes had come out of profits through the reserved fund account. The shareholders were well acquainted with the Act of Incorporation, which allowed 8 per cent. dividend when the price of gas was 7s. 6d., and an increase of 1 per cent. for every reduction in the price of gas of 2½d. per 1000 cubic feet. This full payment of dividend had not for years been offered by the Directors nor demanded by the shareholders. Thanks to this cordial support in conserving the funds, much had been done in the way of improvements in the past; but they must all quite clearly understand that much still remained to be done. The Directors appreciated the way in which the shareholders had accepted the reasonable proposals as regarded the distribution of profits put before them on previous occasions, believing it to be in the best interests of the community and themselves that a large proportion of these profits should be invested in the business. He thought there was a great misunderstanding among the public, and especially among gas consumers, as to the amounts earned by gas companies on the capital invested; and their clients were apparently not aware that the shareholders of the Company had for many years been taking a much smaller dividend than that to which they were entitled. It was generally indefinitely stated that 10 per cent. was being paid by the Gas Company; and no doubt this was understood by many to mean that those who found the whole of the capital of £2,121,745 for the land, buildings, plant, machines, gasholders, mains, services, meters, &c., were receiving a return of 10 per cent., which would amount to £212,174 per annum. This was very far from being correct. The facts were that the premium capital of £466,535 found by the shareholders was not receiving any return at all; the debentures (£798,000) were receiving between 4 and 5 per cent., totalling £37,770; and the shareholders, for their £857,210, were getting 10 per cent., equal to £85,720. The whole interest received, therefore, by those who found the cash for the Company, instead of being £212,000, amounted to £123,490, or £5 16s. per cent. per annum. The shareholders only received on their share and premium capital 6½ per cent., which was not too high a return, but rather on the low side, for they had risks common to trading concerns, as was shown by the drop in their business between 1891 and 1898, and the rise from 1898 to 1909. It was well, too, before counting on future profits, to look closely at the present balance-sheet, and see that more than 20 per cent. of their returns were derived from residuals—a magnificent return, but subject to still more of the risks of competition than gas. However, they could congratulate themselves on these returns amounting to £52,000, as it established a record. The ordinary expenditure for new mains, services, ordinary and slot meters, depreciation on stoves and fittings, &c., independently of the works altogether, amounted, in consequence of the increased business, to about £22,000 each half year; and these moneys had all to be passed through and paid from reserve funds. The large amounts which had been transferred each half year to these funds were virtually all absorbed by current expenditure; and consequently the reserve fund and the meter renewal fund were now approximately the same as they were five years ago, and less than twenty years ago. Owing to these demands, there had been no possibility of building up as strong a reserve fund as a company with such a large capital as theirs should have as a safeguard against contingencies. In addition to the ordinary expenditure already referred to, it was probable, while new retort-houses and improvements on those now existing and alterations in plant were going on at the works, that there would be for these purposes at least an equal amount of expenditure to be added to the sum stated. After referring to the necessity for constructing a new retort-house, probably at West Melbourne, before proceeding any further with the reconstruction of the South Melbourne retort-house—works which would entail a heavy expenditure—the Chairman said there would be no difficulty, with continued prosperity, in finding the money. Summarizing his remarks, he said the duty of the Company was to provide the gas required by the community. In order to do this these works must go on; but they could not go on without funds, and those funds must come out of profits. If they reduced the price of gas at present—and a very small reduction meant an enormous sum to the Company—the profits would not be sufficient to enable them to erect modern plant with the necessary despatch. These should be sufficient reasons; but it might do no harm to mention other subsidiary causes for what one of their shareholders called the "Scotch conservatism of the Board." First, the Company had £410,000 of debentures, bearing 5 per cent. interest, maturing next year. It was expedient to get this arranged for on satisfactory terms. The stronger the cash position of the Company, the better price they could get for their debentures. Secondly, the termination of their three-years coal contract was on the 31st of March next. As they carbonized 85,000 tons of coal during the past half year, which meant between 170,000 and 180,000 tons for the year, the shareholders would see how much they were affected by a rise or fall in the price of this commodity; and, bearing on this, there had recently been a great deal of unrest at Newcastle. A coal miners' strike meant very heavy loss to the Company. The men at the Hetton mine, from which they received two-thirds of their supplies, were not working; but they had been able to obtain supplies elsewhere for some weeks.

Mr. A. O. SACHSE seconded the motion; and it was carried.

The dividend recommended was then declared; and the proceedings concluded with a vote of thanks to the Chairman, Directors, and staff.

## AUSTRALIAN GASLIGHT COMPANY.

The Annual Meeting of this Company was held at the Head Offices in Sydney on the 29th of July—Mr. G. J. COHEN, the Chairman, presiding.

The SECRETARY (Mr. R. J. Lukey) having read the notice convening the meeting, the report of the Directors was presented. It set forth that the net profits for the half year ended the 30th of June, with the balance brought forward, amounted to £67,652; and the Directors recommended the payment of a dividend for the six months of 9s. per share on the old shares and in proportion on the new shares, free of income-tax. This would absorb, in round figures, £60,000, and leave £7652 to be carried forward. At the date of the meeting, the Engineer (Mr. Thomas J. Bush, M.Inst.C.E.) was in England; and the Directors mentioned that during his visit he would personally inspect the latest improvements in the gas industry.

The CHAIRMAN, in moving the adoption of the report, said the increase in the consumption of gas had been well maintained during the half year throughout the whole of the districts covered by the Company's operations. Another satisfactory feature was that, in the city proper, the consumption had never receded, despite the strong competition of the electric light. In this, however, they were only participating in the experience of gas companies in the United Kingdom and on the Continent. The quantity of gas sold during the past six months exceeded that of the corresponding period of last year by 67 million cubic feet—an increase of 6½ per cent. Although this was exceedingly satisfactory, it was, he was sorry to say, more than counter-

balanced by extra expenditure for wages and increased charges for maintenance. The returns from residuals were somewhat disappointing. Sulphate of ammonia, presumably owing to over-production, had been sold at a considerably lower price as compared with that ruling twelve months ago. Coke commanded a good sale. The amount to be disposed of was now much greater than formerly, owing to the increased quantity of coal used in the manufacture of gas; but no accumulation of stocks had to be recorded. Tar alone of all the residuals showed a favourable return. This was owing to the increased demand for it for asphalting and other purposes. The increased consumption of gas, while most encouraging, brought some little anxiety to the Directors, because in some parts of the immense area controlled by the Company the existing mains were undoubtedly being overworked, particularly in the evenings, between the hours of 5 and 7, when gas-cookers were in general use. These defects were more noticeable during the winter months. These difficulties were being met by the laying of either larger or additional pipes in the districts affected. During the past half year, an agreement had been entered into with the outdoor workers, lamplighters, and gas-fitters branches of the Gas Employees' Union; thus bringing into line all the Company's workmen. This agreement was concurrent with the Gas Employees' agreement, and terminated in May, 1911. The action of the Directors in co-operating with the North Shore Gas Company for the establishment of a Wages Board was taken solely for the purpose of settling the question of "Umpire" in case of a dispute, which is not provided for in the existing agreement. Their Engineer (Mr. T. J. Bush) was in England, on leave of absence, partly on account of his health, but more particularly for the purpose of seeing for himself the latest improvements in matters appertaining to gas manufacture, both in the United Kingdom and on the Continent. The report of the Royal Commission on Sydney Improvement had been presented to the Government, and was, he understood, being considered by the Cabinet. He had no further information to impart respecting the suggested resumption of the Company's Head Station at Kent Street, other than that the Commission had confirmed the recommendation. He referred in his last address to the high-pressure inverted incandescent gas lighting of Fleet Street, London. The Company had received samples of these lamps in time to allow of their being exhibited at the Technical College during the late exhibition. Arrangements were now being made to exhibit the lamps in the centre of the City. The public lights had increased during the past half year by 164, thus bringing the total number now in use to 11,457. The agreement made with the lamplighters had greatly increased the cost of lighting; the slight profit hitherto made on this branch of the business having been thereby considerably diminished. The gas-cooker sales numbered 776 during the six months; making the total disposed of by the Company to date 18,375. Record attendances at the weekly lectures had been reported. This undoubtedly accounted for the increased interest shown in gas cookery during the past few years. The day consumption of gas showed considerable advance, and now equalled 46·4 per cent. of the total deliveries. The number of gas consumers had increased by 2633 during the six months—2091 ordinary and 531 prepayment, the total now on the books being 88,647. Extensions of the Company's business had made it necessary to lay 46 miles of additional mains and services in the half year; bringing the total mileage up to 2376.

The report was adopted, and the dividend recommended for the half year—viz., 9s. per share on the old shares and in proportion on the new shares, free of income-tax—was agreed to.

The retiring Directors and Auditors having been re-elected, the Directors and officers were thanked for their efficient services during the half year.

## PROVINCIAL GAS AND WATER COMPANIES.

### Gas.

#### Difficulties of Gas Supply in a Colliery Town.

In moving the adoption of the report and accounts at the recent annual meeting of the Barnsley Gas Company, the Chairman (Mr. E. G. Lancaster) said that, comparing the balance-sheet with that for the preceding year, the manufacture of gas had cost £206 more; but they had spent £416 less on other items under this head, and had a saving of £210. The cost of distribution showed an increase in one item of £1035, of which repairs and maintenance had come to £597 more. Rates and taxes had increased by £706—a charge which pressed very heavily on the Company, and which seemed to increase every year. The result was a net increase of expenditure of £620. On the revenue side, they received £676 more from gas; but residuals had produced £175 less, and the net increase was £398. The result was that they were £220 worse off than before. They often heard it said that, Barnsley being in the centre of the coalfield, they ought to make gas cheaper than anyone else. This was a popular fallacy which on examination faded away. The reason they could not maintain their maximum dividend was because underneath them the coal had been worked. The town was becoming fairly solid again; but to the east the ground was constantly giving, and men were continually at work repairing and renewing the mains. The leakage was excessive. They had now relaid a portion of their mains with steel pipes, which had proved very satisfactory. They had not relaid the whole, because of the increased expenditure. He was not exaggerating when he said one item alone came to £500, which was absolute loss. Then they had a growing expenditure on slot meters; but they hoped to see the end of this during the next two or three years. They would, however, get a return on this expenditure. Then they were sanguine enough to hope they would get back to their full dividends, and also do something for their customers. The report was adopted. Mr. J. Brown, the retiring Director, Mr. J. Laycock, of Keighley, in succession to Mr. S. J. Cooper, who has retired, and Mr. Henry Musgrave, of Blackpool, in succession to the late Mr. Wood, were elected Directors, and Mr. Moulton was re-elected Auditor.

#### Depressed Trade Affects Sales at Hartlepool.

At the annual general meeting of shareholders in the Hartlepool Gas and Water Company last Tuesday, the report and balance-sheet presented for the year ended June 30 showed that the total revenue amounted to £87,339, against an expenditure, including interest on loans, of £54,383; leaving a balance of £32,956 for the year. An interim dividend was paid in March last; and the Directors recommended the declaration of a like dividend for the past half year at the rate of 5 per cent. per annum on the whole of the paid-up consolidated capital, less income-tax. The Directors stated that, in common with other seaports on the north-east coast, trade in the Hartlepools during the past year had been most unsatisfactory and depressed; consequently there had been a decrease in the sales of both gas and water. It was hoped, however, that the current year would show an improvement in the shipping trade and other industries in the district. The Chairman (Mr. T. Appleby), in moving the adoption of the report, expressed his pleasure that it was so satisfactory. When he last addressed the shareholders, he stated that the past twelve months had been a most anxious time for the Directors, owing to the great depression in the trade of the district; and there had been no improvement since, but a still further falling off in the consumption of both gas and water. During the year, an additional 200 slot meters had been fixed; making a total of 7800, and yielding an income of £7681—this amount being a decrease of £456 upon the previous year's revenue from the same source, due, no doubt, to the very large number of empty houses and the decreased earnings of the artisan class. This was apparent from the fact that one house out of every thirteen where these meters were fixed had this year not returned revenue. But, now that work was more plentiful, the returns from this source would doubtless begin to improve. They had been fortunate in getting their coal at lower prices this year; but much of the saving had been absorbed by the reduced revenue from the sale of coke. It was not at all unlikely that next year might see an increased price for coal, due to the Eight Hours Act; and if Lord Joicey's opinion was correct—and there was no better authority on this matter—it was probable that there would in future be a permanently increased price. Though they had cheaper coal, there had been during the year a marked falling off in the price of coke. Not only had the local demand been much less in consequence of the great depression in local industries, but the shipment had fallen away very considerably; and at present there were no indications of better prospects for the current year. The market for tar was still very weak, and showed no improvement upon the previous year. It was thought that the use of it in large quantities as a dust-layer on the public highways would tend to improve the price; but, though much had been done in this direction, and experiments made for its further introduction, it did not seem to have enhanced its value. The average price of sulphate of ammonia had been fairly maintained, and would have been better had the trade with Japan been equal to that of the preceding year. But this trade having been practically suspended for several months, the effect was a falling off in price. It was, however, gratifying to know that trade had now been resumed; for it was one of the most important factors in maintaining good prices. There was again an increase in the amount paid for rates and taxes. Whether or not there would be any limit to these obligations, he did not know; but the increment during the last few years had been considerable, and called for some comment. The Company had an abundant supply of both hard and soft water, for which they would be glad to have additional consumers. The report was adopted.

#### Steady Growth and Prospective Co-Partnership at Ilford.

At the ordinary half-yearly general meeting of the Ilford Gas Company last Wednesday, the Directors reported a sum of £9820 available for distribution; and they recommended dividends for the six months ending the 30th of June at the rates of 6½ per cent. per annum on the "A" and "C" stocks and 5 per cent. per annum on the "B" stock (less income-tax), with a dividend *pro ratâ* on the "C" stock issued in June; carrying £785 to the reserve fund. In moving the adoption of the report, the Chairman (Mr. W. Ashmole) said the growth of the Company had continued during the past half year, though the increases had been smaller than those of recent years. This was not due to any falling off in the demand for gas, as the consumption per consumer had been well maintained, but to slackness in the building trade in the district. The increase in the half year had, however, been 3·39 per cent. over that of the corresponding period of last year; and, in view of the circumstances, the Board considered this very satisfactory. The works (under Mr. W. B. Farquhar, the Engineer and Manager) had been kept in good repair, and the whole plant overhauled and put in order for the winter's work. In order to protect the Company, it was found necessary to appear by Counsel before the Committee of the House of Commons who considered the Bill promoted by the Gaslight and Coke Company to obtain authority for their amalgamation with the West Ham Gas Company. The shareholders would be glad to learn that the Directors had been successful. The subject of co-partnership, to which some allusion was made at the preceding meeting, was under the consideration of the Board, and they hoped to be able soon to formulate a suitable scheme which, while having for its immediate object the benefit of those employed by the Company, would also indirectly benefit the stockholders. In conclusion, the Chairman expressed the wish that the Company might have as prosperous a career in the future as it had had in the past. The report was adopted and the dividends recommended were declared; and the proceedings closed with votes of thanks to the Directors, officers, and staff.

#### Satisfactory Position at Richmond.

At the recent half-yearly general meeting of the Richmond Gas Company, the Directors presented a report in which they recommended a dividend at the rate of 5¼ per cent. per annum on the ordinary stock for the six months ended the 30th of June. The Chairman (Mr. T. J. Carless), in moving the adoption of the report, said the consumption of gas was growing very satisfactorily on the building estate to the east of the gas-works, which promised to be a good revenue producer in the future. Coming to expenditure, coals had cost about the same as during the corresponding period of 1908, when the Company had to face a heavy advance in price; so that their outlay in the past half year was about £1500 above the normal. He was glad to be able to state, however, that the Directors had been fortunate enough to make their new contracts at a considerable reduction; and, fearing that the Mines

(Eight Hours) Act might bring about a rise in prices, they had taken the opportunity to secure themselves for the next two years. Purification had now touched rock-bottom cost; the present figures being lower than he remembered having been recorded since the output of gas approached the present figure. The cost of distribution still grew apace, so much having to be done nowadays to secure new consumers and to keep old ones. Competition for lighting was never so keen as to-day; and the outdoor department of a gas company needed constant and ever-increasing vigilance. Turning to the other side of the account, the amount received for gas sold showed an increase of £747, or something over 4 per cent., which was very gratifying. It was some time since there had been so large an increase in consumption; and when the shareholders remembered how little scope there had been in the neighbourhood of late years, they would appreciate the difficulty experienced in securing an increased output of gas from the works. The receipts for public lighting were somewhat lower through the price per lamp having been brought down; otherwise there had been no shrinkage. The revenue from the rental of meters and stoves and the maintenance of incandescent burners was up somewhat; showing that the business generally was moving in the right direction. Residuals, owing to lower prices ruling, had not brought in quite so much; but, on the whole, they were satisfactory. By reference to the profit and loss account the shareholders would see that they had earned their dividend, which was an important matter; and he congratulated them upon the result of the half-year's working. The immediate future, too, appeared likely to bring equally good returns; and were it not for the drop in the price of coke that had lately taken place, they might have looked for larger profits and all that they brought in their train. The report was adopted, and the dividend declared. The Chairman moved a vote of thanks to Mr. Thomas May (the Engineer and Secretary) and the other officers of the Company. He congratulated Mr. May on having completed 25 years of service, and referred to a presentation of a silver tray and other articles, of the value of 100 guineas, which had been made to him in commemoration of the vent. He hoped the recipient would be spared for another 25 years. Mr. May, in acknowledgment, said that was the fiftieth half-yearly meeting he had attended, and it had always been a great satisfaction to come before the shareholders. The testimonial to which the Chairman had referred was most gratifying for him to receive. He should always value the handsome present; and it would prove an interesting heirloom for his family.

### Reduced Price at Ryde.

At the recent annual general meeting of the Ryde Gas Company, the Chairman (Mr. E. Groves, J.P.) presented the report of the Directors, in which they stated that the accounts for the year ended the 30th of June showed a balance available for distribution of £4708, out of which they recommended the payment of the full authorized dividend at the rate of £5 3s. 9d. per cent. The average cost of coal had been less than in the previous year, and was slightly higher than the contract price for future deliveries. The old-fashioned stack of five beds of retorts, rendered obsolete by the introduction of the regenerative system in 1897, had been pulled down, and the site utilized for coal storage. Four beds, each containing eight retorts, had been renewed; and the whole of the plant and apparatus had been well maintained. It had been decided to reduce the price of gas from 3s. 3d. to 3s. 2d. per 1000 cubic feet from the end of July last, which would be equivalent to about £400 per annum; and the Directors hoped it would lead to increased business. The report was adopted. Votes of thanks were accorded to the Directors, the Manager (Mr. F. F. Farrand), the Secretary (Mr. A. E. Coombes), and the staff and employees for their services during the year.

### Continued Growth at Shrewsbury.

The report presented at the annual meeting of the Shrewsbury Gas Company last Wednesday stated that the profit on the year's working amounted to £8253. An interim dividend of 2½ per cent. was paid in March last; and the Directors recommended that a final dividend of 3 per cent. (making 5½ per cent. for the year), be now declared, leaving a balance of £2424 in the profit and loss account. The reserve fund amounted to £10,963, and was fully invested. There had been an increase of about 3½ million cubic feet in the consumption of gas during the year. The stoves on hire at June 30 numbered 2899; and there were 3478 slot meters in use. The Directors desired to express their great regret for the loss of their late colleague and Chairman, Mr. J. Spencer Phillips, who died in May last, having been a Director since 1880, and Chairman since 1893. In moving the adoption of the report, the Chairman (Mr. T. F. Poole) said their meeting that day was overshadowed by the loss they had sustained by the death of Mr. Spencer Phillips. Before proceeding to propose the first resolution, he should like pay a tribute of respect to his memory. For 29 years as a Director, he gave them of his best, For sixteen years of this time as Chairman, his great ability was exercised in forwarding the interests of the Company. As a Board, they would greatly miss his counsel and his guidance. With regard to the report, it afforded them great pleasure to be able to submit so favourable a one, considering the difficult times through which they had been passing in connection with the coal crisis, and also the depressed condition of trade throughout the country—though in their more or less residential town they did not feel the effect of this general depression so much as those in manufacturing districts. For the fourth year in succession, they were able to pay the dividend of 5½ per cent., to which they were entitled under the sliding-scale, in spite of the fact that they were getting less for their residuals and that the price of coal was still considerably higher than it was a few years ago. Their business showed continuous improvement in every department. They had made 3½ million cubic feet more gas than last year out of 313 tons less coal, bringing the total make, for the first time in the Company's history, to over 200 millions. And so, with a somewhat reduced coal consumption, efficient production, and an increased consumption of gas, despite the poor return for residuals, their accounts showed a substantial surplus. They had entered into an arrangement with the Corporation to convert the existing gas-lamps to the incandescent system, and the work was in progress. Their excellent Manager (Mr. W. Belton) kept the works up to date and in a thoroughly efficient state of repair. The staff, also, under his direction, were thoroughly loyal to the Company. The profits had been more than sufficient to pay the full dividend. The report was adopted, the dividend recommended was declared, and votes of thanks were passed to the Chairman and Directors and the Engineer and staff. In reply to the latter, Mr. Belton referred to his association with the Company during the last thirty years.

### Steady Progress at Tonbridge.

At the half-yearly meeting of the Tonbridge Gas Company on Monday last week, the Chairman (Mr. W. Judd), in moving the adoption of what he characterized as a very satisfactory report, said the period covered by it had been one of steady progress. The increase in the consumption of gas was 3 million cubic feet, or about 6 per cent., over the corresponding six months of last year; while the majority of gas companies had to be content with an increase of from 1 to 3 per cent. He thought these figures were of a very encouraging nature. The report stated that the works and plant had been maintained in a satisfactory condition; and he could assure the proprietors that this was a correct statement, and that everything possible was done to maintain and increase their efficiency. The extension of the main to Leigh had more than fulfilled the expectations of the Directors. The consumption in that village continued to increase, and a new consumer, taking 300,000 cubic feet per annum, had been added within the past few weeks. On the 1st of April the price of gas was reduced by 1d. per 1000 cubic feet, in the expectation of making a satisfactory contract for coal. This hope was fulfilled, and a further reduction of 1d. was made on the 1st of July; making the price 2s. 6d. There was hardly another town in the South of England with a similar population to Tonbridge where the price was so low. The shareholders must feel gratified, more especially as the result of a lowering of the price always was that the consumption increased. The receipts for gas were £305 more than before, notwithstanding the reduction. The revenue from the sale of coke was less, though a much larger quantity had been sold, due partly to the reduced price of coal. One of the most gratifying features of the accounts was the amount received for tar, which was very much in advance of previous years. The whole of the credit for this was due to the Secretary and Engineer (Mr. James Donaldson), who had taken considerable trouble in preparing the tar suitable for use on roads. They could have sold for this purpose more than double their make, and he thought more tar would be required in future for road-surfacing. He was very pleased to mention that the Directors had entered into a satisfactory contract for coal; and he thought that they might look forward to further increased consumption. The report was unanimously adopted. Mr. Lees proposed a hearty vote of thanks to the Directors, and also to the Engineer and Secretary, for the way in which the Company's business had been carried on during the half year. He said it was very gratifying to the shareholders to see the continued improvement in the Company, and also the further reduction in price. Mr. C. F. Catt, in seconding the motion, said the Directors and officials were to be congratulated on the way in which the Company's business was conducted. The motion having been carried unanimously, the Chairman replied for the Directors and himself, and Mr. Donaldson for the officials.

### Prospective Further Extensions at Truro.

In the annual report of the Directors of the Truro Gas Company, reference was made to the fact that for several years the need of additional storage accommodation had been felt; and last winter, owing to the increased demand for gas, the difficulty became acute. Early in the year a tender was accepted from Messrs. Willey and Co., of Exeter, for the supply and erection of a gasholder of 100,000 cubic feet capacity; and this will be completed before the next winter's demand sets in. In view of further extensions, the freehold of some property adjoining the gas-works had been purchased. An issue of £3000 new 5 per cent. preference shares had been made and was considerably over applied for. The accounts showed a credit balance of £1917, and the Directors recommended payment of a dividend of 5 per cent.; leaving £152 to be carried forward. The Chairman of the Company (Mr. John James), in moving the adoption of the report and accounts at the annual meeting, remarked that the cost of coal had been reduced from £4197 to £3789 during the year, and the income from the sale of gas had slightly increased. They had not raised the price of gas when coal advanced so much. This had been to the advantage of the consumers; but the Company had had hard work to make any profit. Mr. J. P. Paull, in seconding the motion, referred to the use of tar for the roads, and expressed the hope that this residual would now become a more valuable product for the Company. The report was adopted, and the dividend recommended was declared; and thanks were accorded to the Secretary (Mr. W. H. Sainsbury), the Manager (Mr. S. J. Ingram), and their staffs. Mr. Ingram, in reply, said he considered the Company were in a very satisfactory position as the result of the past year's working. With the new gasholder which was being erected, they would get over the serious difficulty attending insufficient storage, and be able to store sufficient gas to meet 24 hours' demand.

### Fair Trade and Dividend Maintained at Wolverhampton.

The accounts for the half year ended the 30th of June, which were presented at the ordinary general meeting of the Wolverhampton Gas Company last Tuesday, showed a net profit of £9095. This enabled the Directors to recommend the payment of dividends at the same rates as before—viz., 3 per cent. on the preference stock, £5 2s. 6d. per cent. on the consolidated stock, and £3 2s. 6d. per cent. on the new ordinary stock, less income-tax, and to carry to the reserve fund the balance of the excess dividend undivided, as authorized by the Act. They further recommended that £277 11s. 6d., interest for the half year, be placed to the credit of the reserve fund; £47 8s. 4d., like interest, to the credit of the insurance fund; and that the balance should be carried forward. The Chairman (Mr. B. O. Clark), in moving the adoption of the report, said the shareholders would see by the accounts that the profits made were not so great as they had been in previous years—not so great even as last year. The year's profits were down by £1400; but as the expenses were a good deal less, they were able to pay the same dividend as before. Everything with regard to the selling of gas had gone wrong, and trade generally had been bad.

However, the report, he thought, would show that the Company had done a fair trade. Mr. H. H. Ward seconded the motion and it was carried.

### Water.

**Large Capital Expenditure at Hawarden.**

At the half-yearly general meeting of the Hawarden Water Company on the 28th ult., the Directors reported a balance of £1238 available for distribution; admitting of the payment of a dividend at the rate of 3 per cent. per annum, free of income-tax, and the carrying forward of £537. The Engineer (Mr. W. Simmons) reported that during the six months ended the 30th of June water had been laid on to 116 houses, bringing up the total to 3626; the estimated population being about 18,130. The trade consumption, registered by meter, was 5,038,000 gallons. The reservoirs and mains were in good order; and the construction of the new storage reservoir at Cilcain would probably be completed before the end of the year. Work was in progress on the foundations for the filtration plant, which it was hoped would be in operation some time in October. The Chairman (Mr. James Tomkinson, M.P.), in moving the adoption of the report, said the income of the Company had increased, compared with the corresponding half of last year, by £98; but the expenditure had risen in a rather larger degree—viz., by £108. The net result was that the £1176, which was the balance of profit over expenses (compared with £1186), was equal to a dividend of 4½ per cent. on the total paid-up capital of £44,740. It might occur to some shareholders to ask how it was that, having earned 4½ per cent., the Directors only proposed to distribute 3 instead of 3½ per cent., which had been the usual steady level of dividend for some years. The fact was they had had to undertake a large capital expenditure. They were making a fine new reservoir to hold 20 million gallons, which would be one-and-a-half times as large as the whole of their storage at the present moment. They were also installing filtration plant at a cost of £1400; and they had laid a large and costly main. All this very heavy capital expenditure it was impossible to repay out of profit. They therefore hoped the proprietors would take up something like £4000 worth of shares, which would be offered to them at a discount. He thought they would be a very good investment, in view of the present position and prospects of the Company. The business was certainly progressive; and very shortly now, with their completed reservoirs and extended neighbourhood, they ought to reap the full benefit of the large expenditure they had made. The report was adopted, and the dividend recommended was declared.

## CO-PARTNERSHIP AT WESTON-SUPER-MARE.

At the recent half-yearly general meeting of the Weston-super-Mare Gas Company, the Chairman (Mr. H. F. Price) said the most interesting feature in the Directors' report was the co-partnership scheme which had been introduced, and of which the following were the chief points: (1) To set aside a sum by way of bonus equal this year to £2 10s. per cent. on the earnings of all employees who sign agreements, and thus become partners. (2) This bonus will be increased ¾ per cent. for every 1d. reduction in the price of gas, or decreased by the same amount in the event of a rise in price. (3) The bonus will be paid to Trustees for the co-partners, and by them placed to the credit of each co-partner, according to his earnings. (4) One-half of each man's share will be placed to an investment account for the purpose of buying (when a sufficient amount) ordinary stock in the Company, and the other half to a withdrawable account; in both cases bearing interest at 4 per cent., until invested in stock. A co-partner may add to his investment or withdrawable account from other sources, and so become entitled to purchase stock at an earlier date than he otherwise could. The scheme, the Chairman added, was based on the Croydon plan, but adapted to suit local conditions. The cost was estimated at not more than £150 per annum on the present business. The Directors were satisfied that the adoption of the scheme would be very much to the advantage of the Company. The scheme was unanimously approved and adopted.

## SOUTH STAFFORDSHIRE WATER COMPANY.

The Half-Yearly General Meeting of this Company was held at the Offices, in Birmingham, last Tuesday—Alderman C. G. Beale in the chair.

The Directors reported that the number of houses laid on during the half year ended June 30 was 928; making the total supplied 136,970. The gross amount of water-rates for the half year was £73,251, against £71,955 in the corresponding period of the previous year. They had transferred the sum of £1000 to the depreciation fund; thus raising it to £31,220. After providing for interest on the debenture stock and the dividend on the preference stock, the amount remaining for distribution (including £7806 brought forward) was £29,041. The Directors recommended the declaration of a dividend for the half year on the ordinary stock at the rate of 6½ per cent. per annum, less income-tax. The amount of this dividend being £20,984, there would remain £8057 to the good. The Directors added that the Company's Bill for confirming the pumping-stations erected during recent years and for sanctioning a new station at Maple Brook had passed; and, in common with other water undertakings applying for similar confirmation, the Company had had to accept very wide obligations as to compensation for drainage where it could be shown to have occurred, and concessions had to be made to Local Authorities opposing the Bill. These obligations did not directly affect the revenue for the past half year; but, in anticipation of their future effect (the extent of which could as yet only be estimated), they had thought it prudent to make reserves in certain directions, and to strengthen the contingent fund.

The Chairman, in moving the adoption of the report, said the past half year had been a very eventful one, and one not without serious anxieties. The Company had had to go to Parliament, and had had a strenuous time; but they had come out with what they wanted, though they had had to concede somewhat onerous terms in order to succeed. Referring to the revenue account, water-rates had gone up £1296, due in the first instance to an increase of £1048 in domestic charges, and £248 in meter charges. The latter was due chiefly to public purposes and buildings, and not to private supplies, as the latter had gone down by about £75; showing that at present they had not felt any revival of trade in their district leading to a removal of the depression they had experienced in their charges for some time past. Rates had gone up by £198. His predecessor always had something to say about the rates; and he (the speaker) could not look at them in a more cheerful light. They were always going up. It was due to a slight increase in the assessment and in the poundage. Incidental expenses had gone down by £461; while current law charges had gone up by £562. They had added £1000 to the depreciation fund—a thing which they were not at all accustomed to do at this period of the year. Then there was the serious matter with which they had been faced during the past half year. He need not tell them why they went to Parliament. They found themselves, under a decision of the Court of Appeal, in this position—that every one of the pumping-stations they had erected since 1875 was declared to be *ultra vires;* and the Company were liable to be attacked on all sides for having taken water out of the ground which they had no right to take. They were, in fact, attacked immediately. The Kingswinford District Council, and another on the Lichfield side, commenced proceedings against them for injunctions. These actions were undefended, for they could not see what could be gained by going on with them; and though they told these authorities they were applying to Parliament for sanction for all these works, and the authorities themselves, when they got to Court, said: "We do not ask you to stop the works, and we quite agree the injunctions can be suspended until you have been to Parliament," they went on, and put the Company to the increase of £500 odd to which he had referred. He was, and had been all along, utterly unable to see what was to be gained by such action. All that could be said was that there was a nice little dispute in the Chancery Court, which did nobody any good. The Company went to Parliament in this position. The injunctions were granted; and the Court held them over so that the Company might put themselves right by going to Parliament. They were not the first Water Company to go to Parliament this year. The original victims were the Frimley and Farnborough Company; and Parliament put upon them very stringent clauses giving compensation to landowners whose water supplies and wells had been drawn upon by the operations of the Company. It was obvious that the South Staffordshire Company were not going to escape a similar liability, and they had 29 petitions against their Bill, the majority being on the question of compensation. The Company faced the position immediately, and offered a very full compensation clause to those landowners and others who alleged they had been drained. In many instances it was accepted, but not in all; and when they got to Parliament they found themselves opposed by five or six owners of water supply, who claimed they had been, or would be, damaged by what the Company were going to do. It was quite clear their policy was to show the Parliamentary Committee that they were quite prepared to meet all the claims in a fair and reasonable way. They succeeded in this, because there was not, from first to last, a word of suggestion that they were not acting in a fair and reasonable manner towards those who had made claims. This was proved by the fact that ultimately only one of their opponents had to take the decision of the Committee. The shareholders would no doubt ask how this was going to affect the future of the Company. He would place the facts before them, and they must draw their own inferences. The Chairman then went in detail into the various points connected with the parliamentary proceedings, and concluded by saying that the general effect of the compensation clauses in the Act was that where a landowner or occupier could show, or raise an unmistakable presumption, that they had drawn by their pumping operations on his well or water supply, they must, as nearly as possible, put him in his original position free of cost. The Company paid in water if they could; if not, they paid him compensation in money. It was probable that in most cases they would be able to pay in water instead of in money. As to the future of the Company, all he would say was that he should be very much disappointed if they had to reduce the dividend lower than it was this half year. The Directors would do their best to maintain the dividend at what it stood at now, and hoped the increase in the population of the district, and the possible revival in trade, would soon enable them to revert to their old position.

Mr. F. H. Lloyd seconded the motion; and it was carried unanimously.

The dividend recommended was declared; and the proceedings closed with a vote of thanks to the Directors.

## BARNET DISTRICT GAS AND WATER COMPANY.

**Increased Sales of Gas—Difficulty in Obtaining Further Water.**

The Half-Yearly General Meeting of this Company was held last Tuesday, at the Holborn Restaurant, W.C.—Mr. Arthur F. Phillips, M.Inst.C.E., in the chair.

The Secretary (Mr. Ernest W. Drew, F.C.A.) read the notice convening the meeting; and the Directors' report (which was noticed in last week's "Journal," p. 594), and the statement of accounts, were taken as read.

The Chairman, having mentioned that both Mr. A. H. Baynes and Dr. J. W. L. Glaisher were away taking a needed rest, said that, as he felt bound to take the proprietors through other important matters, he did not propose to go, in detail, over all the figures. They indicated an improvement in the results attained, and an extension of the business. The expenditure on capital account was, on the gas undertaking £3312, and on the water £4553, which was practically all for extensions of mains. For the gas undertaking, there had been laid during the half year 6312 yards of main, varying from 4-inch to 14-inch, resulting in a net increase in the length of mains equal to 4697 yards; for the water, 10,491 yards, varying from 4-inch to 16-inch, had

been laid, resulting in a net increase of 8228 yards. The extension of gas and water mains, after allowing for replacements, was 12,925 yards, or (say) 7⅓ miles. This, with a small amount for meters, accounted for the capital expenditure. The gas revenue showed a net increase in the receipts of £979; while the expenditure increased £450—resulting in a profit of £529 more than in the corresponding previous half year. The expenditure on distribution showed an increase of £974, for which the repairs of mains and meters were answerable. The meters were all being examined. The water revenue was £994 more; while the expenditure had increased by £1072—resulting in a decrease in the profit of £78. The increase in expenditure was chiefly due to mains. It had been necessary to make considerable alterations owing to the extension of the tramways; and while the bulk of the expenditure had been repaid by the County Council, there were many alterations made and services relaid which it was not advisable to charge to capital, and of which revenue had had to bear the cost. There was an increase in the sale of gas of 4,953,000 cubic feet, equal to 7·84 per cent., when compared with the corresponding half year; and this was highly satisfactory in these days of keen competition with the electric light and the reduced consumption of gas consequent on the extended use of more economical burners. It was evidence that their officers were looking well after the business. The gas manufactured per ton of coal was 11,656 cubic feet, which was 454 cubic feet more than in the previous half year. The quantity sold was 10,783 cubic feet per ton; the amount unaccounted for being 7·49 per cent. This was more than it should be; but he might remind the shareholders that the Company had a considerable mileage of mains, some of which were old. They were being examined; and the Engineer reported that he was finding many small leaks. The fuel consumption on the gas-works was 17¼ per cent. During the half year new services were laid to 148 ordinary and 173 prepayment consumers—making a total of 321, and bringing the number of gas consumers up to 4944. The new water-services laid during the six months numbered 356. The quantity of water supplied to the district was 303,916,000 gallons, or 33,472,000 gallons less than in the corresponding period—a result reflecting credit on the management, showing that the waste of water was receiving attention. There was a reduction in pumping charges from £1839 to £1498, due to less water having been pumped, and to using as far as possible the pumping-stations which were the most economical in working. The profit from the gas undertaking was £3368, from the water supply £9399, and from fittings £94—together £12,861. Interest and income-tax absorbed £2221, and the dividends proposed £9889—leaving a surplus of £751. But as £1000 had been transferred to the contingency fund, it left a balance to carry forward of £17,687, against £17,936 at Christmas last. In the report there was an unpleasant paragraph, on which the proprietors might desire further information. It was well known that year by year the level of the water at the Company's pumping-stations continued to permanently fall, while at the same time the district continued to develop and the demand for water to increase. Considering the wells were on the high ground, that clay overlaid much of the chalk, and that there were also wells of the Metropolitan Water Board pumping substantial quantities of water, this result was not surprising. To the Directors, however, it caused the greatest anxiety. It was ever uppermost in their minds, and was always under consideration. Water must be obtained to meet the demands of the immediate future. Considerable sums were spent in seeking additional supplies; and the most eminent engineers and geologists had been consulted. In these endeavours to obtain the first necessary of life, and to comply with the statutory obligation laid upon the Company, nothing had been done without the most mature consideration. In 1904, the Company promoted a Bill in Parliament to authorize the sinking of a well at Bayfordbury, in the valley of the Lea, which was outside the Company's limits, and the construction there of a pumping-station, with the necessary main to conduct the water into the Company's district. The Bill was strongly opposed by the Hertfordshire County Council, the Metropolitan Water Board, and the territorial magnates. It passed the Commons; but in the Lords the part of the Bill authorizing the Company to go to Bayfordbury was struck out. The opponents alleged that the Company had not exhausted the supplies which could be obtained within their own limits. They had hanging on the wall a large map showing a site at Tyttenhanger (which was within the Company's limits), where it was considered water could be obtained. The Directors were aware of this; but the distance was considerable, and it was doubtful if the quantity required would be obtained. In view of the great expense the Company had incurred, and the urgent necessity of providing for their district, the suggestion was accepted. As the Company did not own the land, and no powers to purchase had been taken, it was not possible to definitely authorize in the Bill a pumping-station at Tyttenhanger; but the Committee, after much discussion with the opposing Counsel, gave a special clause which was considered sufficient to enable the Company (if the land could be purchased by agreement) to erect a pumping-station there. This clause (10) in the Company's Act of 1904 was so important that he would quote it:

> The Company may by agreement purchase, take on lease, or acquire and hold for the purposes of the water undertaking (in addition to any lands by the Acts of 1872, 1883, and 1887, or any of them, authorized to be purchased, and the land in the parish of Shenley within the limits of deviation delineated on the deposited plans) any lands within the limits of supply not exceeding in the whole 15 acres, and may on all or any of such lands execute for the purposes of, or in connection with, the water-works any of the works and exercise any of the powers mentioned in, or conferred by, section 12 of the Water-Works Clauses Act, 1847.

To show the importance of these last words, he must read one of the provisions of section 12 of the Water-Works Clauses Act of 1847:

> They may from time to time sink such wells or shafts and make and maintain, alter, or discontinue such reservoirs, water-works, cisterns, tanks, aqueducts, drains, cuts, sluices, pipes, culverts, engines, and other works and erect such buildings upon the lands and streams authorized to be taken by them as they shall think proper for supplying the inhabitants of the town or district within the prescribed limits with water.

Surely this clause meant something; and if it had any meaning, it was that if the Company acquired the land within their own limits, they had the right to sink there a well for supplying water to their district. He was present in the Committee-room when the clause was settled, and had a clear recollection of the discussion which took place between the Counsel engaged and the Committee. He had no hesitation in saying the clause was given with the intention of authorizing the Company to erect the pumping-station, provided the land could be purchased. The reason for the clause would be found in the notes of evidence—"That they were content, having regard to the particular circumstances of this case, and to the undoubted want of water." Counsel representing the Hertfordshire County Council and the territorial opponents "accepted it, in regard to the special circumstances of the case." The only restriction put upon the Company was that the pumping should not be in Middlesex. It followed that the Committee and all the Counsel agreed and expected that the Company would at once endeavour to purchase land in Hertfordshire within their own limits, and erect a pumping-station. To suppose the clause was only given to enable the Company to make additions to their existing works, was to assume that the Committee were devoid of common-sense, because the Company had proved in evidence to their satisfaction that no more water could be obtained from the existing pumping-stations. As soon as the Bill became an Act, the Directors, considering that the Company's powers ample, took steps to acquire certain land at Tyttenhanger; and after having put down a boring and ascertained that there was an abundant supply of water, plans and specifications were prepared and a contract was entered into for constructing the pumping-station. After considerable progress had been made, the Directors were surprised to receive a letter from the Solicitors of the Marquis of Salisbury, requesting the Company to desist from sinking the well, and stating that, unless this was done, an application would be made to the High Court of Justice for an injunction. The Company naturally replied that they were sinking the well under the powers contained in their Act of 1904; but notwithstanding this, action was taken against the Company, and the Directors were surprised that the injunction was granted, and the work had to be stopped. He must here digress a little for the sake of those proprietors who were not well informed on all that took place with regard to water supply. Water companies having in their Acts the ordinary power to purchase land within their limits and on it construct works for the purpose of the undertaking, had always considered this sufficient authority to sink wells and construct pumping-stations. Many works had been erected all over the country under such conditions, including some by the late London Water Companies. Some three or four years ago, the Frimley and Farnborough District Water Company sank a well under these conditions, when the High Court ruled that the power to acquire additional land for the purposes of the undertaking did not authorize the construction of a new pumping-station. He believed it was the decision in this case that led to the injunction being applied for against the Company's work at Tyttenhanger. The position was, however, not the same, because the Frimley Act did not contain the special proviso that on such land they could exercise all or any of the powers contained in section 12 of the Water Works Clauses Act, 1847. The Directors considered it a hardship in 1904 that, while the Metropolitan Water Board were allowed to pump from the Lea Valley vast quantities of water (he believed it was nearly 30 million gallons per day in 1907-8), the Barnet Company could not have a few million gallons for the supply of their district, mostly in Hertfordshire. The position was still worse when they were prevented from pumping water which was in their district—the principal reason assigned being that it might affect a small well 1¾ miles away, which supplied the village of Hatfield. This well and all the works connected with it were carried on without statutory authority of any kind. The Barnet Company did not desire this water supply as a source of profit. The dividends paid to the proprietors had been kept down for years, in consequence of the costs that had been incurred in endeavours to obtain water. The Company must have water to fulfil their statutory obligations. It was vital to their existence; and this was the only position within their limits where there was a probability of obtaining it. The Company had no desire that anyone should suffer injury from the proposed works at Tyttenhanger. The fear of affecting the well at Hatfield was most remote; and the other well mentioned in the case, at Essendon, could not possibly be affected. It was a small tube sunk by the side of the River Lea in a different watershed 5 miles away. As he previously remarked, the water-works at Hatfield existed without statutory authority; and they were stated to be a source of considerable profit. It seemed unreasonable that the inhabitants of an important and growing district like Barnet should be deprived of a supply of water which rightly belonged to them for mere sentimental reasons attaching to the Hatfield well. The Board held in the very highest estimation the Most Honourable Marquis at whose instigation these proceedings had been taken; and they deeply regretted the expense he might have been put to and the very large expense the Company had incurred, as well as the further costs in which they would be involved. But they feared he had been unfortunately advised. They were of opinion that, under their Act, they had the right to take water at Tyttenhanger; and as, according to an old proverb, "He who exercises a right does no one an injustice," the Directors would endeavour by every lawful means to secure the rights they believed Parliament intended they should possess. There was no alternative. They must have the water; and, having already spent considerable sums in obtaining the Act, the purchase of the land, and the sinking of the well, the interests of the proprietors demanded it. He concluded by moving the adoption of the report and accounts.

Mr. ALFRED LASS, F.C.A., seconded the motion.

Mr. W. B. BRYAN thought the Directors were right in appealing. The interim injunction was granted without hearing them; and he was quite of opinion that on appeal they would win. The cases in which injunctions had been secured were on a different footing, for there was not the special proviso that was in the Barnet Company's Act. Anyhow, he was sure if they went before a Parliamentary Committee and explained everything there, they would get their Bill.

The CHAIRMAN remarked that at present they hoped to get Tyttenhanger. If they failed, they would have to look out for another source. They must go outside their limits.

The resolution was then carried unanimously.

Proposed by the CHAIRMAN, and seconded by Mr. FREDERICK LENNARD, dividends were declared for the half year, less income-tax, at the rates of 7½ per cent. per annum on the "A" and "C" stocks,

6½ per cent. per annum on the "B" stock, and 5¼ per cent. per annum on the "D" capital gas and water stocks.

Mr. JAMES L. CHAPMAN, Assoc.M.Inst.C.E., in moving a vote of thanks to the officers, said the balance-sheet showed that both departments of the undertaking had been excellently worked. There was a high make and sale of gas, a low percentage of fuel used, a good quality of tar sold, and a large amount of sulphate of ammonia made; and when they looked at the effect of all this on the accounts, they would agree with the vote he proposed to the Engineer and Manager (Mr. F. J. Bancroft, M.Inst.C.E.), Mr. Drew, and Mr. Wright.

Mr. LASS seconded the motion, which was heartily carried.

Mr. BANCROFT, in acknowledgment, said that, as the shareholders would have gathered, from the remarks of the Chairman, the Company had had a strenuous time; but they had a staff who were working loyally and well, both for the benefit of the proprietors and to give satisfaction to the consumers.

Mr. DREW and Mr. WRIGHT also briefly replied.

Mr. F. R. SMITH proposed a hearty vote of thanks to the Board—and more especially to Mr. Phillips for the able and exhaustive report he had given them on the water question. It was not often, he remarked, that a Board took the proprietors so fully into their confidence as Mr. Phillips had done; and he was sure they all appreciated the time and trouble he had given to the matter. He hoped the result of the appeal which had been referred to would be to vindicate the position of the Company.

Mr. C. A. BANNISTER seconded the resolution, which was unanimously passed.

The CHAIRMAN, in returning thanks, remarked that the position of the Company just now was an exceedingly trying one, and required a great deal of time and attention on the part of the Board. But they hoped for success.

## THE GAS PROBLEM AT SALFORD.

### The Supply to Consumers in Out-Districts.

Considerable discussion took place at a Meeting of the Salford Town Council last Wednesday on the following resolution submitted by Alderman Phillips, the Chairman of the Gas Committee: "That the Council be recommended to authorize the Gas Committee to enter into negotiations with the out-districts with regard to the supply of gas; and, in the event of a reasonable understanding not being attainable, to intimate that the Council will seek relief from the obligation to supply." This was the resolution adopted at a special meeting of the Gas Committee held the previous evening, and confirmed later by the General Purposes Committee of the Council.

In moving the resolution, Alderman Phillips said it must be recognized that the gas undertaking at Salford existed primarily for the benefit of the inhabitants of the borough, and only secondarily for the supply of consumers in the out-districts. For a long period they had not had a particularly happy time with the out-districts, although concession after concession had been made to them. To-day, Eccles and Swinton were being supplied with gas at the same figure as the inhabitants of the borough itself, and Worsley and Barton at a price only 2d. per 1000 cubic feet above that charged in Salford. Barton was very sparsely populated—only one person to the acre; and no profit had ever been made out of the supply of gas to the district. In fact, these out-districts were enjoying a convenience at the expense of the ratepayers of Salford. Notwithstanding this, whenever the Corporation went to Parliament with a Bill which included gas clauses, necessitated by the growth of the undertaking, the out-district authorities opposed them, with the object of getting further concessions. There was opposition in 1897; but it was settled by the Corporation granting terms which they thought would be satisfactory. But when the Corporation again went to Parliament this year, there was opposition once more from the out-districts; and the decision of the Committee of the House of Lords was so inimical to the interests of Salford, that the Bill was withdrawn. If the decision had been accepted, it would have practically taken away the Corporation's power to make a profit out of the gas undertaking—a result which would have placed the ratepayers in a serious position. It cost the Corporation now more to supply gas to the out-districts than to the borough itself; and the time had arrived when there must be a limit to the concessions. These districts were not only dependent upon Salford for gas, but for trams, the treatment of infectious diseases, and other advantages, including the education of technical students. If they would not agree to reasonable terms, there was no alternative but for Salford to seek relief from the obligation to supply them with gas, and leave them to take their affairs into their own hands.

The resolution was carried unanimously.

Arrangements are being made for a conference of representatives from the various authorities affected by the resolution. The Clerk to one of the District Councils concerned says it raises a new issue; and he expressed the opinion that the Corporation cannot refuse to supply the districts with gas until some other provision has been made. It is recalled, in connection with this dispute, that when Salford sought powers, in 1891, to raise fresh gas-works capital, Eccles and Swinton were empowered to promote, within two years, a Bill to erect gas-works and to purchase the portion of the undertaking of the Corporation affecting these districts. In 1892, Swinton promoted a Gas Bill; but Eccles did not join. The Salford Corporation opposed the Bill, on the ground that the power given was a joint one which could only be exercised by the two authorities in combination; and in consequence of the former not having joined, the Bill was thrown out.

At Pulborough, Sussex, a new water company is in course of formation, and it is proposed to issue £1 shares. The cost of the scheme is estimated to be something like £3000; and it has been recommended to sink an artesian well 250 feet deep in a field near the railway station.

## THE PROPOSED NEW GAS-WORKS FOR BELFAST.

### Negotiations with the Harbour Commissioners.

The Gas Committee of the Belfast Corporation recently had a meeting at which a good deal of discussion took place in regard to the proposed new gas-works; and the Committee considered in detail the estimates of the value of the sites and surface levels, with the capitalized value of the cost of the carriage of coal for thirty years—this information, as already reported (*ante*, p. 531), having been prepared by the officials concerned. Several questions were asked by various members as to the mains, plant, residual product works, and other points; and these were answered by the City Surveyor (Mr. H. A. Cutler) and the Gas Engineer and Manager (Mr. Robert Sharpe).

It appears that no definite decision was arrived at as to the merits of the different sites offered; but, on the suggestion of the Chairman (Mr. J. A. Doran), it was resolved that the Belfast Harbour Commissioners should be asked for replies to the following questions in relation to the site on their property: (1) In the event of the Corporation selecting a site for new gas-works on the harbour property at the East Twin Island, will the Commissioners oppose or assist the Corporation in obtaining the necessary parliamentary powers? (2) Will the Commissioners confirm the offer of their Works Committee of Nov. 9, 1908—viz., £750 per acre for a site of 36 acres? (3) Will the price of land include all necessary wayleaves for the gas-mains, &c.? (4) Who will maintain the present embankments and pitching during the construction of the gas-works and afterwards, including the land on the water sides of the proposed site reserved by the Commissioners on the Musgrave and Victoria Channels? (5) Who will make and maintain approach roads? (6) In the event of the Harbour Commissioners changing the position of any road or street, or in the event of subsidence occurring in any road or street through which gas-mains are laid, who will pay cost of alterations and repairs to mains? (7) Will the Commissioners extend the water-main to the proposed site, to provide a water supply from the Water Commissioners' mains? (8) Will the Commissioners provide for drainage? (9) In the event of the Gas Committee taking the site, will any conditions be imposed by Harbour Commissioners?

On the suggestion by a member of the Committee, it was agreed to add the following question: If the site on the East Twin Island be not adopted, will the Harbour Commissioners let a site for a jetty for unloading coal for the exclusive use of the Corporation? If so, where, and at what cost? It was further decided to submit the following additional queries: Are the Harbour Commissioners willing to enter into a contract for the discharge of coal from vessels into lighters or waggons? If so, at what price per ton? In the event of coal being conveyed by the Corporation tramways from the harbour to any site, would there be any charges by the Harbour Commissioners? If so, what, (*a*) in the event of the Harbour Commissioners renting an exclusive site for unloading, and (*b*) in the event of no exclusive site being allotted?

The further consideration of the question of the site for the new works was adjourned.

## NORTHAMPTON WATER-WORKS EXTENSIONS.

### Local Government Board Inquiry.

Last Thursday, Mr. M. K. North, M.Inst.C.E., held an inquiry, on behalf of the Local Government Board, at the Northampton Town Hall, into an application by the Corporation for sanction to borrow £6600 for purposes of water supply, including the construction of a service reservoir at Boughton. The Town Clerk (Mr. Herbert Hankinson) stated that the Corporation had purchased 11 acres of land at Boughton in 1901 for the reservoir; but, as there was then no immediate necessity to proceed with it, the matter had remained quiescent until comparatively recently. Of late, however, it had become advisable to increase the pressure and the supply to the high-level district of the town, which, in spite of the Corporation's legal obligation, was not at present adequate. Additional high factories had been erected during recent years, which he thought were not under contemplation at the time the site for the reservoir was acquired. Owing to special circumstances, the Board had sanctioned the acceptance of a tender for the pipes, &c., before sanction was given to the loan. The estimate for the mains was £2529; and the figure still held good. The estimate for the covered service reservoir was £4070; but the actual lowest tender was for £4365, and it had been accepted. It therefore became necessary to amend the application to the extent of the difference in the amounts, strictly speaking from £6600 to £6900. A formal resolution of the Council would be forwarded in due course. The Water Engineer and Manager (Mr. Frank Tomlinson) stated that a portion of the work had been carried out. The Inspector inquired why it had been begun in anticipation of sanction. The Town Clerk explained that the Corporation were hoping that the inquiry would have been held in July; and they wrote asking the Board to so arrange it. But this did not turn out to be feasible; and the matter was deemed of such urgency, and the pipes had already been purchased, that it was proposed to carry out that part of the work. When it was found that the inquiry would be further delayed, it was felt that the only satisfactory way would be to go on. Mr. Tomlinson pointed out that the work could not be carried out later in the year. The Town Clerk asked that the loan might be spread over a period of 35 years. A detailed statement in regard to the plans was then given by Mr. Tomlinson; and as there was no opposition, the inquiry closed, and the Inspector paid a visit to the site.

The Metropolitan Private Water Supply Syndicate, Limited, has been registered with a capital of £1000, in £1 shares, to carry on the business of consulting, civil, electrical, and general engineers, contractors, well sinkers, and water-supply engineers and contractors. One of the first Directors is Mr. Eardley Bailey-Denton. The offices are at No. 62, King William Street, E.C.

## NOTES FROM SCOTLAND.

**From Our Own Correspondent.**

*Saturday.*

The projected gas legislation for Glasgow was foreshadowed in the "Glasgow Herald" of Wednesday, in an article in which it was stated that the proposed new Provisional Order for the consolidation of the local Acts of Parliament relating to the Glasgow Corporation's gas undertaking had been before a Joint Committee of the Parliamentary Bills and Gas Committee, who recommended to the Corporation its adoption, and also that a conference should be held with the Scottish Office in regard to the suggestions made in it as to the sinking funds. New provisions or amendments on other existing provisions in the local Acts have been introduced in the new Order. Regarding the price, it is proposed to introduce in the Order the provisions now usually inserted in all Gas Acts with regard to the charges for gas, whether for public or private purposes, whereby all consumers in the same circumstances, and requiring the same extent of supply, will be supplied on the same terms and conditions; and the Corporation will also be empowered to make special contracts or agreements with persons requiring a special supply. It is proposed to re-define the city supply district (referred to in the Act of 1891) so as to include all places and districts entitled to be supplied at city rates, and to enact that all districts beyond the city supply district and within the limits of supply of the Corporation shall be designated the supplementary supply district, in which a differential rate may be charged. It is proposed to include within the description of the gas lands all ground which the Gas Engineer considers is required for the manufacture and storage of gas or residual products, and to give the notice required by the Standing Orders of Parliament in connection therewith. At present, the Corporation have power to reduce the quality of the gas to 16 candles. It is proposed to take permissive power in the Provisional Order to reduce the quality to 14 candles, as has recently been done in a number of Gas Acts obtained by other municipal corporations and private companies. A clause is suggested that fittings, engines, &c., hired out by the Corporation are not to be subject to the landlord's hypothec, though fixed to the premises supplied with gas, but are to remain the property of the Corporation. Power is also to be sought to require the use of anti-fluctuators for gas-engines driven by gas supplied by the Corporation. It is suggested that it would be expedient to unify the various sinking funds now in operation in connection with the Gas Department by equating the periods within which the various amounts authorized to be borrowed fall to be repaid, so as to make one period for the whole. It is also suggested that the present sinking fund of 1⅛ per cent. on £1,000,000 (being the estimated capitalized value of the Corporation gas annuities in 1901) should be hereafter calculated upon the present capitalized market value of these annuities, so far as not redeemed, which is estimated at £590,877. These suggestions are made, subject to the proviso that the same, if given effect to, will not involve a large increased payment in respect of sinking fund.

The accounts of the Aberdeen Corporation Gas Department for the year ending July 31 have been issued. They show a total revenue of £122,637—an increase of £1453 over the previous year. Gas and meter-rents produced £95,101, made up as follows: Ordinary consumers, £76,645; motive power, £6809; prepayment meters, £11,536; and meter-rents, £29. Residual products realized £24,808; house services, £1178; gas-stoves, £1416; and rent and feu-duties, £129. The expenditure amounted to £99,884—a decrease of £5579. The balance carried to net revenue account was thus £22,753. A year ago it was £15,720. The cost of coal was £54,976, as compared with £66,698. Oil and coke for carburetted water gas cost £5431, and purifying materials £1401. Salaries of the Engineer, Analyst, and officers at the works amounted to £958, and wages of stokers and labourers to £11,963. Maintenance of works cost £1051, and of plant £4539. The total expenditure on the manufacture of gas was £80,977. Distribution cost £4229. House services cost £1263. The outlay upon gas-stoves was £1693, and wages and other expenditure amounted to £921; while £772 was written off as depreciation. Rents, feu-duties, and taxes amounted to £5271. Management cost £1928; the general charges came to £887; and discount and bad debts to £3871. The charge for annuities was £4105; and interest on mortgages, bank accounts, and reserve fund amounted to £4080. The sum placed to sinking fund for the redemption of mortgages amounted to £10,004; and for the redemption of annuities to £650. The contribution to the reserve and insurance fund was £300. A sum of £3000 has been placed to the renewal fund; and a balance of £612 is carried forward. The general balance account shows the amount expended on works to have been £443,027; and with funds and stocks on hand this sum is raised to £470,223. During the year 67,851 tons of coal were carbonized, from which 694,487,000 cubic feet of gas were made. With 81,675,000 cubic feet of carburetted water gas, the total quantity of gas made was 776,162,000 cubic feet. The gas accounted for was 729,881,000 cubic feet, and unaccounted for 46,281,000 cubic feet, or 5·96 per cent. The gas-rental was £95,101. The price per 1000 cubic feet was 2s. 7d. to ordinary consumers and 2s. 4d. for motive power. Bad debts amounted to £332. On Wednesday, the Gas Committee had before them the estimates for the current year. The revenue from gas is estimated at £92,813, and from residual products at £23,930—a total of £116,743. The expenditure is estimated at £120,003. Taking into account a sum of £3399 at credit, the estimates bring out a surplus of £139. Last year the expenditure was estimated at £122,025. The Committee agreed to recommend that the price of gas to ordinary consumers be reduced from 2s. 7d. to 2s. 6d. per 1000 cubic feet, and to users for motive power from 2s. 4d. to 2s. 3d.; also that prepayment meter consumers should receive 29 cubic feet for 1d., instead of 26 feet as at present.

In view of the movement for a gas transfer at Carnoustie, which has now reached the stage of the taking of a plebiscite of the ratepayers, there was more interest than usual in the statement submitted by the Directors of the Carnoustie Gas Company to the shareholders at their fifty-fourth annual meeting on Wednesday, at which ex-Provost Ramsay presided. The balance-sheet and profit and loss account for the year to Aug. 4 were submitted and approved of. The net profit was £675, out of which a dividend at the rate of 7½ per cent. was declared, which

## GAS COMPANIES' STOCK AND SHARE LIST.

**Referred to on p. 623.**

| Issue | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | £ s. d. |
| 590,000 | 10 | Apl. 16 | 10 | Alliance & Dublin 10 p.c. | 17⅞—18¼ | .. | 5 9 7 |
| 898,955 | 10 | ,, | 7 | Do. 7 p.c. | 12⅝—13 | .. | 5 7 8 |
| 310,000 | Stk. | July 14 | 4 | Do. 4 p.c. Deb. | 96—98 | .. | 4 0 0 |
| 200,000 | 5 | May 27 | 6⅛ | Bombay, Ltd. | 5⅞—6⅛ | .. | 5 10 8 |
| 40,000 | 5 | ,, | 6⅛ | Do. New, £4 paid | 4½—4⅝ | +1/16 | 5 9 6 |
| 50,000 | 10 | Aug. 26 | 15 | Bourne- | 10 p.c. | .. | 5 5 3 |
| 311,810 | 10 | ,, | 7 | mouth Gas | B 7 p.c. | .. | 4 3 7 |
| 75,000 | 10 | ,, | 6 | and Water | Pref. 6 p.c. | .. | 3 16 8 |
| 380,000 | Stk. | Aug. 12 | 12½ | Brentford Consolidated | 250—253 | .. | 4 18 10 |
| 300,000 | ,, | ,, | 5⅛ | Do. New | 190—192 | .. | 4 19 0 |
| 50,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 120—122 | .. | 4 2 0 |
| 206,250 | ,, | June 11 | 4 | Do. 4 p.c. Deb. | 100—102 | .. | 3 18 5 |
| 220,000 | Stk | Mar. 12 | 11† | Brighton & Hove Orig. | 213—215 | .. | 5 2 4 |
| 246,320 | ,, | ,, | 8† | Do. A Ord. Stk. | 154—156 | .. | 5 2 7 |
| 467,000 | 20 | Apl. 16 | 10 | British | 43—43½ | .. | 4 11 11 |
| 109,000 | Stk. | Aug. 26 | 6 | Bromley, A 5 p.c. | 117—119* | .. | 5 0 10 |
| 165,700 | ,, | ,, | 4½ | Do. B 3½ p.c. | 88—90* | .. | 5 0 0 |
| 82,278 | ,, | ,, | 5⅛ | Do. C 5 p.c. | 106—108* | .. | 5 1 10 |
| 54,000 | ,, | June 25 | 3½ | Do. 3½ p.c. Deb. | 88—90 | .. | 3 17 9 |
| 500,000 | 10 | May 13 | 7 | Buenos Ayres (New) Ltd. | 13⅜—14¼ | +⅛ | 4 18 3 |
| 250,000 | Stk. | June 25 | 4 | Do. 4 p.c. Deb. | 94—96 | .. | 4 3 4 |
| 103,000 | 10 | — | — | Cape Town & Dis., Ltd. | 4⅛—5 | .. | — |
| 100,000 | 10 | — | — | Do. 4½ p.c. Pref. | 5½—6 | .. | — |
| 50,000 | 50 | May 3 | 6 | Do. 6 p.c. 1st Mort. | 48½—49½ | .. | 6 1 3 |
| 100,000 | Stk. | June 25 | 4½ | Do. 4½ p.c. Deb. Stk. | 82—84 | .. | 5 7 2 |
| 157 150 | Stk. | Aug. 12 | 5 | Chester 5 p.c. Ord. | 106½—108½ | .. | 4 12 2 |
| 1,493,280 | Stk. | Aug 26 | 5 1/16 | Commercial 4 p.c. Stk. | 107—109* | .. | 4 15 5 |
| 560,000 | ,, | ,, | 5 | Do. 3½ p.c. do. | 103—105* | .. | 4 15 3 |
| 475,000 | ,, | June 11 | 3 | Do. 3 p.c. Deb. Stk. | 81—83 | .. | 3 12 3 |
| 800,000 | Stk. | ,, | 5 | Continental Union, Ltd. | 95—97 | .. | 5 3 1 |
| 200,000 | ,, | ,, | 7 | Do. 7 p.c. Pref. | 138—140 | .. | 5 0 0 |
| 491,270 | Stk. | ,, | 5 | Derby Con. Stk. | 121—123 | .. | 4 1 4 |
| 55,000 | ,, | — | 4 | Do. Deb. Stk. | 103—105 | .. | 3 16 2 |
| 14⅛,995 | ,, | Mar. 31 | 5 | East Hull 5 p.c. Ord. | 100—102 | .. | 4 18 0 |
| 486,090 | 10 | July 14 | 12 | European, Ltd. | 24½—25 | .. | 4 16 0 |
| 354,060 | 10 | ,, | 12 | Do. £7 10s. paid. | 18⅝—19 | .. | 4 14 9 |
| 15,141,545 | Stk. | Aug. 12 | 4⅜ | Gas 4 p.c. Ord. | 104—105 | .. | 4 8 10 |
| 2,630,000 | ,, | ,, | 3½ | light 3½ p.c. max. | 87—89 | .. | 3 18 8 |
| 3,799,735 | ,, | ,, | 4 | and 4 p.c. Con. Pref. | 103—105 | .. | 3 16 2 |
| 4,193,975 | ,, | June 11 | 3 | Coke 3 p.c. Con. Deb. | £6—97 | +½ | 3 8 11 |
| 258,740 | Stk. | Mar. 12 | 5† | Hastings & St. L. 3½ p.c. | 93—95 | .. | 5 5 3 |
| 82,500 | ,, | ,, | 6½† | Do. do. 5 p.c. | 118—120 | .. | 5 8 4 |
| 70,000 | 10 | Apl 29 | 11 | Hongkong & China, Ltd. | 17⅞—18½ | .. | 6 0 7 |
| 131,000 | Stk. | Mar. 12 | 6½ | Ilford A and C | 141—143 | .. | 4 10 11 |
| 65,783 | ,, | ,, | 5 | Do. B | 106—108 | .. | 4 12 7 |
| 65,500 | ,, | June 25 | 4 | Do. 4 p.c. Deb. | 102—104 | .. | 3 16 11 |
| 4,940,000 | Stk. | May 13 | 8 | Imperial Continental | 179—181 | .. | 4 8 5 |
| 1,235,020 | Stk. | Aug. 12 | 3½ | Do. 3½ p.c. Deb. Red. | 95—97 | .. | 3 12 11 |

| Issue. | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | £ s. d. |
| 195,242 | Stk. | Aug. 26 | 6 | Lea Bridge Ord. 5 p.c. | 118—120* | .. | 5 0 0 |
| 561,000 | Stk. | ,, | 10 | Liverpool United A | 223—225* | .. | 4 8 11 |
| 718,100 | ,, | ,, | 7 | Do. B | 64½—66½* | .. | 4 4 1 |
| 306,083 | ,, | June 25 | 4 | Do. Deb. Stk. | 104—106 | .. | 3 15 6 |
| 75,000 | 5 | June 11 | 6 | Malta & Mediterranean | 4⅜—5⅛ | .. | 5 17 1 |
| 560,000 | 100 | Apl. 1 | 5 | Met of 5 p.c. Deb. | 101—103 | .. | 4 17 1 |
| 250,000 | 100 | ,, | 4½ | Melbourne 4½ p.c. Deb. | 102—104 | .. | 4 6 7 |
| 541,920 | 20 | May 27 | 3⅜ | Monte Video, Ltd. | 12½—13 | .. | 5 7 8 |
| 1,775,892 | Stk. | July 29 | 4½ | Newc'tle & G'tesh'd Con | 106½—107½ | .. | 4 3 9 |
| 518,795 | Stk. | June 25 | 3½ | Do. 3½ p.c. Deb. | 92—93 | .. | 3 12 2 |
| 55,940 | 10 | Aug. 26 | 7 | North Middlesex 7 p.c. | 13—13½* | .. | 5 3 8 |
| 300,000 | Stk. | Apl. 29 | 8 | Oriental, Ltd. | 136—141 | .. | 5 13 6 |
| 60,000 | 5 | Mar. 31 | 8 | Ottoman, Ltd. | 6⅛—6⅜ | .. | 6 5 6 |
| 341,920 | 53 | Aug. 26 | 13 | Portsea Island A. | 137—139* | .. | 4 19 0 |
| 60,000 | 50 | ,, | 13 | Do. B. | 129—131* | .. | 4 19 3 |
| 100,000 | 50 | ,, | 12 | Do. C. | 120—123* | .. | 4 17 7 |
| 114,800 | 50 | ,, | 10 | Do. D and E. | 101—103* | .. | 4 17 1 |
| 398,490 | 5 | May 13 | 7 | Primitiva Ord. | 6½—7⅛ | .. | 4 18 4 |
| 796,080 | 5 | July 29 | 5 | Do. 5 p.c. Pref. | 5⅛—5⅜ | .. | 4 10 11 |
| 483,900 | 100 | June 1 | 4 | Do. 4 p.c. Deb. | 91—96 | .. | 4 3 4 |
| 1,000,000 | 10 | Apl. 29 | 8 | River Plate Ord. | 16¾—17⅛ | ..* | 4 12 9 |
| 312,650 | Stk. | June 25 | 4 | Do. 4 p.c. Deb. | 90—98 | .. | 4 1 8 |
| 250,000 | 10 | Mar. 31 | 8 | San Paulo, Ltd. | 14⅛—14¾ | .. | 5 8 6 |
| 62,500 | 10 | ,, | 6 | Do. 6 p.c. Pref. | 12—12½ | .. | 4 16 0 |
| 125,000 | 50 | July 1 | 5 | Do. 5 p.c. Deb. | 49½—50⅜ | .. | 4 19 0 |
| 135,000 | Stk. | Mar. 12 | 10 | Sheffield A | 231—233 | .. | 4 5 10 |
| 269,984 | ,, | ,, | 10 | Do. B | 231—233 | .. | 4 5 10 |
| 523,500 | ,, | ,, | 10 | Do. C | 231—233 | .. | 4 5 10 |
| 70,000 | 10 | June 11 | 10 | South African | 13¾—14 | .. | 7 2 10 |
| 6,429,895 | Stk. | Aug. 12 | 5⅛ | South Met., 4 p.c. Ord. | 119—121 | .. | 4 8 1 |
| 1,895,445 | ,, | July 1 | 3 | Do. 3 p.c. Deb. | 85—86 | +⅛ | 3 9 9 |
| 209,820 | Stk. | Aug. 26 | 8 | South Shields Con. Stk. | 153—155* | +3 | 5 3 3 |
| 605,000 | Stk. | Aug. 12 | 5⅛ | S'th Suburb'n Ord. 5 p.c. | 118—120 | .. | 4 11 8 |
| 60,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 120—122 | .. | 4 2 0 |
| 117,058 | ,, | July 14 | 5 | Do. 5 p.c. Deb. Stk. | 122—124 | .. | 4 0 8 |
| 502,310 | Stk. | May 13 | 5 | Southampton Ord. | 110—112 | .. | 4 9 3 |
| 120,000 | Stk. | Aug. 12 | 6⅜ | Tottenham A 5 p.c. | 132—134 | +2 | 5 2 7 |
| 453,940 | ,, | ,, | 5⅜ | and B 3½ p.c. | 110—112 | +1 | 4 15 11 |
| 149,470 | ,, | June 25 | 4 | Edmonton 4 p.c. Deb. | 100—102 | .. | 3 18 5 |
| 182,320 | 10 | June 11 | 8 | Tuscan, Ltd. | 9—9½ | .. | 8 8 6 |
| 149,900 | 10 | July 1 | 5 | Do. 5 p.c. Deb. Red. | 99—101 | .. | 4 19 0 |
| 236,476 | Stk. | Aug. 14 | 5 | Tynemouth, 5 p.c. max. | 109—111 | .. | 4 10 1 |
| 255,636 | Stk. | Aug. 26 | 6⅜ | Wands- B 3½ p.c. | 138—140* | .. | 4 14 8 |
| 79,416 | ,, | June 25 | 3 | worth 3 p.c. Deb. Stk. | 73—75 | .. | 4 0 0 |
| 895,872 | ,, | Aug. 12 | 5⅜ | West Ham 5 p.c. Ord. | 124—126 | .. | 4 5 4 |
| 210,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 127—129 | .. | 3 17 6 |
| 253,300 | ,, | June 25 | 4 | Do. 4 p.c. Deb Stk. | 112—114 | .. | 3 10 2 |

Prices marked * are "Ex div." † Next dividend will be at this rate.

absorbed £450, and the balance of £225 was placed to the reserve fund. The Directors submitted a statement regarding the present position of the negotiations with the Town Council. Mr. A. Silverthorne, of London, inspected the works on Dec. 16 last, and reported to the Town Council that the value of the undertaking was £15,980. There were some very serious and vital misstatements in this report, to which the attention of the Directors had been drawn by their Manager. On March 2 last, the Town Council offered £16,000 for the undertaking, exclusive of cash in hand and stocks. Alternatively they offered to take over the whole assets and liabilities of the Company at a capitalized sum to be arrived at on the basis of £2 15s. per share on 4000 shares. These offers were so ridiculously inadequate that the Directors refused them. On March 5, the Town Council asked the Directors to give an indication of the sum at which the shareholders would be prepared to sell. They therefore instructed Mr. A. Yuill, of Dundee, to value the undertaking and report. Mr. Yuill reported that he valued the undertaking at £22,396, exclusive of cash in hand and in bank, stocks, and book debts, amounting to £1274—a net total of £23,670. He considered this value a very fair one. On July 7 the Directors intimated to the Town Council that they were prepared to recommend the shareholders to sell their undertaking at this price. On July 12, the Directors had a conference with Provost Walker, Bailie Rae, and ex-Provost Soutar (as representing the Council); and Messrs. J. Nicoll, R. C. Mathewson, and W. M'Naughton (as representing the ratepayers). At this conference, Mr. Nicoll intimated that he thought the ratepayers would be willing to approve of £20,000 as the price, and ex-Provost Soutar stated that the Town Council were prepared to offer £19,000. On July 15, the Directors informed the Council that they would recommend the shareholders to sell for £21,000. Since then there had been no further communication received from the Town Council.

It is an agreeable sign of civic intelligence to find that an interest was taken by the community of Carnoustie in the gas transfer. There were a few doubting ones who gave voice to their opinions by means of newspaper correspondence. But over and above this movement, a more forcible development has arisen in the step taken by Bailie Rae in addressing outdoor meetings of the ratepayers. On Wednesday he addressed two meetings. The burden of his remarks was that it did not matter to the gas consumers of Carnoustie whether one or a score of irresponsibles were egotistical enough to imagine that they were gas experts. What they really had to concern themselves about was not altogether what the works were worth, but whether the undertaking could be purchased at such a price as would enable the Town Council to give the consumers better terms. He was perfectly satisfied that this could be done. He produced the balance-sheets of the Company for the past two years, and these, he stated, showed that the Town Council would have almost £2000 to work upon. The meetings were decidedly favourable to the transfer. Then last night there was a public meeting in support of the transfer, at which a resolution in favour of the step was unanimously adopted.

## CURRENT SALES OF GAS PRODUCTS.

**Sulphate of Ammonia.** LIVERPOOL, *Sept.* 4.

The month has opened with good demand, and production has been readily absorbed, but, though prices continue to harden, there has been no decided advance. The closing quotations are: £11 5s. per ton f.o.b. Hull, £11 6s. 3d. per ton f.o.b. Liverpool, and £11 8s. 9d. to £11 10s. per ton f.o.b. Leith. For delivery up to the end of the year, £11 8s. 9d. to £11 10s. per ton, according to port, has been paid, and £11 12s. 6d. per ton f.o.b. Leith for the spring months. At the close, £11 15s. per ton f.o.b. Leith, for 1910 delivery, is being quoted, but so far this price has not been reported paid.

**Nitrate of Soda.**

This article continues quiet without any alteration in values; the spot quotations still being 9s. 6d. and 9s. 9d. per cwt. for ordinary and refined qualities respectively.

**Tar Products.** LONDON, *Sept.* 6.

The markets have continued steady during the week. Pitch is very firm all round, and the majority of makers are holding their hands at present in the hope of securing better prices. Orders from the Continent are scarce; but in South Wales the demand is again good for prompt delivery. Creosote is quiet, and orders decidedly scarce; but makers are hopeful that American orders will come along freely at an early date. Meantime, shipments are good, and the majority of stocks small. Benzols are quiet; but toluol is in good demand in the North. Solvent is steady all round, and decidedly firm in London for London makes. Carbolic is very dull, and 60's are said to have been sold at 10¾d. Rotterdam, equal to 10¼d. east coast. Naphthalene is dull, and salts are steady. Tar is fetching good figures.

The average values during the week were: Tar, 15s. 3d. to 19s. 3d. Pitch, London, 30s.; east coast, 29s. 9d. to 30s.; west coast, 28s. 6d. to 29s. 6d. f.a.s. Mersey ports, 28s. to 28s. 6d. f.o.b. other ports. Benzol, 90 per cent., casks included, London, 6¼d. to 6½d.; North, 5¾d. to 6d.; 50-90 per cent., casks included, London, 7d. to 7⅛d.; North, 6½d. to 7d. Toluol, casks included, London, 8¾d. to 9d.; North, 8½d. to 8¾d. Crude naphtha, in bulk, London, 3¼d. to 3⅜d.; North, 3d. to 3⅛d.; solvent naphtha, casks included, London, 11d. to 11¼d.; North, 10d. to 10¼d.; heavy naphtha, casks included, London, 10⅛d. to 10⅜d.; North, 9½d. to 9⅝d. Creosote, in bulk, London, 2⅜d.; North, 2⅛d. to 2¼d. Heavy oils, in bulk, 2⅞d. to 2 15/16d. Carbolic acid, 60 per cent., casks included, east coast, 10⅛d. to 10⅜d.; west coast, 10⅜d. to 10½d. Naphthalene, £4 10s. to £8 10s.; salts, 37s. 6d. to 40s., packages included and f.o.b. Anthracene, "A" quality, 1⅛d. to 1⅜d. per unit, packages included and delivered.

**Sulphate of Ammonia.**

The market has been steady throughout the week, and the slight improvement shown at the close of last week has been maintained.


# *TRIBUTES of MERIT*

**No. 2. DAVIS'S STEAMLESS RADIATOR is admirable for Church Heating.**

THE four 6-loop Steamless Radiators you supplied for a church in this district in December last have given great satisfaction. The authorities were very pleased at the low cost of heating during the March quarter.

I have fixed others in various buildings, and in every case they are spoken highly of. The Steamless Radiators have given no trouble whatever.

*THE DAVIS GAS STOVE COMPANY, LTD.,*
*:: :: Steamless Radiator Specialists, :: ::*
*DIAMOND FOUNDRY, LUTON.*

The Gas Companies are still quoting £11 7s. 6d., and are hopeful of obtaining this figure ere long. London makes are reported to have been sold on Beckton terms at £11 2s. 6d. Hull stuff has been sold at £11 3s. 9d. and £11 5s., and to the end of June next at £11 7s. 6d. At Liverpool and Leith, about £11 5s. and £11 7s. 6d. are the values respectively.

## COAL TRADE REPORTS.

### Northern Coal Trade.

There is a little more activity and steadier prices in the coal trade of the North. In steam coals, best Northumbrians are from 11s. 3d. per ton f.o.b., with a rather fuller demand. Second-class steams are from 10s., and steam smalls are from 5s. to 6s. Work at the collieries is now less interrupted, and there is a more regular shipment—mostly on contracts, however. In the gas coal trade, the demand is steadily improving, both for home use and for export; and the only difficulty has been a slight lack of ready steamers at some of the shipping ports. Durham gas coals vary from 10s. to 11s. 3d. per ton f.o.b. for the usual classes; and for "Wear" specials up to about 11s. 7½d. is quoted. More sales are negotiating for export, though slightly lower prices are now offered than a month ago—about 10s. per ton being the f.o.b. price named for second-class Durham coals; but sellers are not so ready to accept this price, though the tendency is to ease in values at the present time. Coke is firmer; and good gas coke is from 12s. 6d. to 13s. per ton f.o.b. in the Tyne—the output being now heavier.

### Scotch Coal Trade.

The coal market is quiet, the demand not being equal to the output. Notwithstanding, though buyers are desirous of purchasing forward, coalowners are not disposed to accommodate, unless at substantially advanced prices. The quotations now are: Ell 9s. to 10s. 6d., splint 10s. 3d. to 10s. 6d., and steam 9s. 3d. to 9s. 6d. per ton f.o.b. Glasgow. The shipments for the week amounted to 364,196 tons—an increase of 21,799 tons upon the previous week, and of 52,531 tons upon the corresponding week of last year. For the year to date, the total shipments have been 9,827,139 tons—an increase of 593,119 tons upon the corresponding period.

**"Aladdin" Incandescent Oil-Gas Lamp.**—Demonstrations were given with these lamps last week in the open air, in South Market Street, Aberdeen. The lamps are made in two sizes—1000 and 300 candle power. The demonstrations given were with the larger lamp. It is claimed that any brand of petroleum can be used with the lamp; and also that it can be used in the open air in any kind of weather. The larger light, it is said, can be run at a cost of ½d. and the smaller one at ¼d. per hour. The demonstrations gave satisfaction to spectators who are interested in the lighting of large work places, such as fish-curing yards, of which there are many in Aberdeen.

## Salford's Supply of Gas Coal.

A resolution passed by the Salford Corporation Gas Committee, rescinding the acceptance of a tender for the supply of coal to the department, and substituting that of another firm, gave rise to a good deal of discussion at a meeting of the Council last Wednesday. It was stated, in support of the resolution, that the sample load did not meet the requirements, and accordingly coal of a better quality was recommended. Those who opposed the resolution argued that the firm whose tender it was now sought to reject would supply the better quality at a figure which was 3d. per ton lower than that of the firm to whom it was proposed to give the order. Alderman Phillips, the Chairman of the Gas Committee, explained that the offer to supply at 3d. per ton less was only made some weeks after the tenders sent in had been opened and published. Consequently, it would be manifestly unfair to accept an amended tender made in so irregular a fashion. Mr. Bescoby moved an amendment that the resolution should be referred back; but it only found four supporters.

**Ottoman Gas Company, Limited.**—In the report to be presented at the meeting of the Company to-day, the Directors state that the gas-rental for the six months ended the 30th of June amounted to £17,082, whereas for the corresponding half of last year it was £15,232. The net profit is £4204, against £3755 for the six months ended June 30, 1908. The amount standing at the credit of the profit and loss account is £12,290; and the Directors recommend the payment of a dividend at the rate of 7 per cent. per annum on the preference shares, less income-tax, and at the rate of 8 per cent. per annum on the ordinary shares, tax free—leaving a balance of £9393 to be carried forward.

**Local Government Board and Applications for Loans.**—In the course of an inquiry held at Torquay last week, on behalf of the Local Government Board, respecting the application of the Town Council to raise certain loans, Mr. F. H. Tulloch, one of the Board's Inspectors, made some remarks on the practice of local authorities in executing works and then applying for authority to borrow the money to pay for them. One of the sums which the Corporation asked for was £2865 for the extension of water-mains and other works arising out of the increasing demand for water. The Water Engineer (Mr. S. C. Chapman) explained that the works were rendered necessary by the general growth of the district, and that in consequence of the demand for water some of the work had been already executed—the cost being defrayed by an overdraft at the bank. The Inspector said the Local Government Board did not like things being done in this way. Application should be made for a sufficient sum to last not more than three years; and then, on a loan being granted, a record should be kept of the streets in which mains were laid, and particulars of the cost, so that when the money was exhausted a loan could be obtained for another three years. These things could usually be foreseen; and the view of the Board was that permission should be obtained first, and the work done afterwards.


# NOTICE.

*THE BLAND LIGHT SYNDICATE, LTD., have had to seek the assistance of the Courts for Infringement in connection with their well-known Burners. The action has been disposed of on satisfactory undertakings being given and on payment of an agreed sum for damages and costs.*

The **BLAND BURNER** is entirely of **BRITISH MANUFACTURE.**

All **BLAND BURNERS** are Manufactured on scientific lines under **ENGLISH PATENTS.**

The **BLAND BURNER** embodies points not known in any other Burner.

The **BLAND GAS REGULATING NIPPLE** is guaranteed **GAS PROOF.**

All **BLAND** Burners are stamped **BLAND PATENT.**

The **BLAND** inner Bulbs are made of the celebrated **MONOPEL** Glass, which will **NOT CRACK OR FUSE.**

**THE BLAND LIGHT SYNDICATE, Ltd.,** 63, QUEEN VICTORIA ST., LONDON, E.C., & 20, FENNEL ST., MANCHESTER.

## Large Water-Main Contract for Calcutta.

It is always pleasant to hear of the success of English firms—especially during times such as those we have recently been passing through. We are therefore glad to learn that the well-known and old-established firm of Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees, have been awarded a contract of considerable magnitude in a world-wide competition for the supply, delivery, and erection in Calcutta of 6 feet and 5 feet riveted steel mains for the water supply of the city. The Corporation Engineer (Mr. W. B. MacCabe, M.Inst.C.E.), after carefully considering the numerous tenders offered, recommended the design of Messrs. Ashmore, Benson, Pease, and Co. as represented by the drawings submitted with their offer. The main lines of pipes will be 6 feet and 5 feet internal diameter, with reducing-pieces and valves at the various branches, which occur at frequent intervals, to connect up to the smaller distributing mains. The total length of the main lines will be about 4¼ miles. They will pass through the principal thoroughfares of the city, and where necessary will be carried by riveted lattice girder bridges with water-trough bottoms over canals and railways. The bridges, which also form part of the contract, will have suitable arrangements providing for expansion and contraction. The total weight will be considerably over 3000 tons. The whole of the materials in the contract will be of British manufacture. The work has to be completed within two years from receipt of instructions to commence; and as three months of each year is a rainy season during which it is not practicable to continue the work of erection, this means that the whole contract must be carried out in eighteen months.

**Successful Rating Appeal at Malton.**—We learn from Mr. Henry Tobey, the Secretary and Manager of the Malton Gas Company, that, as the result of an appeal, the Assessment Committee of the Malton Union have agreed to reduce the rateable value of the Company's property from £708 to £550. The appeal was based upon the decreased profits the Company are making owing to the low price of gas, the competition of electricity, the loss of public lighting, the enhanced price of coals, and the extra labour and expense attending penny-in-the-slot installations.

**Suicide by Gas at Liverpool.**—An inquest has been held on the body of Joseph Watson, who was formerly a farmer in Australia, but came to Liverpool about two years ago, and had since carried on a general shop. For some time deceased had been depressed and worried. Last Tuesday, his wife left him in charge of the shop, while she went to look after some business; and on her return some hours later, she found a note in his handwriting, and called a neighbour, who sent for a policeman. The latter went upstairs and discovered deceased lying on the bed with an india-rubber tube, which had been fastened to the gas-bracket in his mouth. The room was full of gas. The doctor who was called pronounced life extinct, death being due to gas poisoning. The jury returned a verdict of "Suicide while temporarily insane."

**The Dangerous Chandelier Again.**—Serious personal injury and a great deal of damage to property were caused at West Hartlepool on the 28th ult. by a severe gas explosion at the residence of Mr. R. J. Marshall, a builder and contractor, who resides on the road leading to Hartlepool. Mrs. Marshall had detected a smell of gas in the dining-room, and informed her husband, who, with his son, went into the room. The former poured some water into the chandelier, from which the escape occurred, and apparently a match was afterwards struck, for there was an explosion, which shattered almost every window in the house, as well as seven in a house on the opposite side of the street. The contents of the room were thrown about in the most extraordinary manner, and some valuable oil paintings were ruined. Mr. Marshall was for a moment enveloped in flame, and was dashed against a wall by the force of the explosion. He was found to have been badly burned about the arms and eyes, and his hair was burnt off. His son escaped with slight shock.

**High-Pressure Gas-Lighting at Wolverhampton Skating Rink.**—The Wolverhampton Gas Company have recently had in hand the lighting of the skating rink, the area of which is about 170 ft. by 120 ft. The high-pressure system has been adopted, with Graetzin lamps, inverted burners, and the provision of independent flues to effect the dispersion of the products of combustion. The results are increased illumination, which is absolutely shadowless. There are five burners in each lamp, giving a light of 600 candles per lamp, with a consumption of 25 cubic feet of gas per lamp. There are in all 30 lamps in use, giving a lighting power of about 18,000 candles, at a cost of 2s. per hour for the whole of the lighting of the rink. This is controlled in sections by bye-pass taps, so that the attendants can have the lighting under their control without entering the skating area. The installation, which is on a novel and effective system, has been carried out under the supervision of Mr. P. G. Winstanley, the Gas Company's Engineer and Manager.

**Penny-in-the-Slot System a Remedy for Defaulting Gas Consumers.**—At the Halifax Borough Police Court, a few days ago, about 80 defaulting gas consumers were summoned. The defendants generally pleaded inability to pay on account of sickness or unemployment; and in some cases orders for payment in fourteen days were made—more time being allowed in a few cases where prolonged unemployment had been experienced. The Chairman (Mr. J. H. Howarth) said the Bench wished him to ask Mr. Farrar (representing the Corporation) why a number of these defaulters could not be put on the penny-in-the-slot system. Mr. Farrar replied that they could; but that it rested with them to make application. The Chairman: Why should not the Corporation take the matter in hand and put slot-meters in? You might make a regulation that if the consumers would not have these meters you would not supply them with gas. He added that the Bench were of opinion that if this were done it might be a remedy in a great many cases; and it would be better for the customers as well as for the Corporation. Mr. Farrar said he would see that the suggestion was sent to the Committee.

Gas Plant and all constructional Steel and Iron Work.

Specialists in Slot Meters, Ordinary Meters, Wet & Dry.

WILLEY & CO., LTD., ENGINEERS,

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The Pioneers of Slot Installations.

Gas Fires.

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SHOW-ROOMS: LONDON, 18, Adam Street, Adelphi, W.C.; DEVONPORT, 93, Fore Street.

**Two Light Failures at Clapham (Yorks.).**—A correspondent who was recently spending the week-end at the above-named place informs us that on the evening of Sunday, the 29th ult., the electric light at the church failed immediately after the sermon; and upon the visitors (including the clergyman) returning to the hotel, the acetylene gas followed the lead of the other illuminant, and went out. This was a rather curious coincidence.

**Gas Question at Heckmondwike.**—A meeting of the Heckmondwike Urban District Council was held last Thursday, for the purpose of discussing the advisability or otherwise of joining with the Liversedge Council in promoting a Parliamentary Bill authorizing the formation of a Joint Board to acquire the Heckmondwike and Liversedge Gas Works. After discussion in committee, it was moved by the Chairman (Mr. S. Wood), seconded by Mr. Clarke, and unanimously approved, that the members vote for the statutory resolution referring the matter to the consideration of the ratepayers.

**Water-Works for Elloughton and Brough.**—On Saturday, the 28th ult., the water-works which have been erected for the supply of Elloughton and Brough were formally opened by Mrs. Harrison-Broadley. The water is obtained from certain springs issuing from the chalk in two plantations belonging to Colonel Harrison-Broadley, M.P., on either side of Elloughton Dale, about half-a-mile from Elloughton. The water, which is described by analysts as admirably suited for drinking and domestic purposes, flows by gravitation into a reservoir having a capacity of 60,000 gallons, or equal to two days' maximum supply. Colonel Harrison-Broadley, who presided at the opening ceremony, expressed the hope that the water would give every satisfaction to the users. As the water-works were owned by a private company, there would be no increase in the rates. He recommended the scheme to the notice of the East Riding County Council.

**The Proposed Acquisition of the Pontypridd Water Company by Local Authorities.**—After a formal report had been submitted to the Pontypridd Council, at a recent meeting, as to the rejection of the Glamorgan Water Board Bill by the House of Lords, the members discussed in private the possible acquisition of the undertaking of the Pontypridd Water Company conjointly with the Rhondda Council. The Clerk (Mr. Colenso Jones) intimated that the Water Company were prepared to dispose of their undertaking to the two Councils on the terms agreed upon for its purchase by the County Council had the Bill gone through. These were £310,000 for the existing undertaking, £15,000 in respect of the parliamentary powers obtained for the construction of the Llia (Breconshire) scheme, together with subsequent parliamentary expenses in the promotion of Bills, and an amount to be fixed upon by the Local Government Board as compensation to the Directors and officials of the Company. A Committee of seven members was appointed to meet representatives of the Rhondda Council, to confer as to the acquisition of the undertaking, and, provided an agreement can be arrived at, to seek parliamentary powers for its purchase.

**Suicide of an Actress by Gas.**—A verdict of "Suicide while of unsound mind" was returned by the Coroner's Jury who inquired into the death of Mary Wilde (aged 67), of Kilburn, who at one time was an actress. Deceased was found dead in bed, with the apertures of the door and windows of her room stuffed up with paper, and the tap of a gas cooking-stove turned full on.

**The Fatal Gas Explosion at Southport.**—The adjourned inquest was held at Southport, on Monday last week, by Mr. S. Brighouse, concerning the death of Alice Ann Nuttall, aged ten years, of Dyson Street, Blackburn, who died as the result of a gas explosion at the house of her uncle, Isaac Nuttall, grocer, 20, Southbank Road, Southport, where she was visiting, on the 12th ult. (see *ante*, p. 470). Mr. Nuttall, who was badly injured in the explosion, said he went into a bedroom, and there detected a smell of gas. He tried the taps, and found they were off. His wife went into the sitting-room, and told him she could smell gas. He went there, tried the taps, and then pulled down the chandelier in order to put water into it. Finding no escape, he brought a lighted taper and turned on the taps. He had ascended about three steps when the explosion took place. The Jury returned a verdict of "Accidental death."

**The Lighting of Paignton.**—An example of the "pushing" methods of electric light companies was afforded at the last meeting of the Paignton District Council, when a letter was read from the local Electric Light Company offering to alter and adapt twelve of the existing gas-lanterns for 50-candle power Osram lamps. The Company would maintain the lamps and supply lighting for 1500 hours per annum at a cost of £2 10s. per lamp, provided they were given a contract for three years. The Lighting Committee recommended that, as an experiment, three lamps should be adapted to electric light as proposed. Mr. Foxworthy said the Gas Company would be prepared to supply 100-candle power burners and lanterns for the same cost. If the lighting had not been satisfactory, complaint should have been made to the Gas Manager, who would have remedied it. When they adopted electric lighting for the sea-front, they were told that it would do away with 27 gas-lamps; but so far only 14 lamps had been removed, and he did not see where the saving came in. Mr. Moore, a Director of the Gas Company, was in favour of the Council adopting the best light at the cheapest cost. When the present gas-lamps were put up, they were equal to a light of 100-candle power each. If they had since given less satisfactory results, the Gas Company were prepared to clean the burners and lanterns and replace the mantles, so as to make them equal to what they were at first. Mr. Sarson, a Director of the Electric Company, disclaimed any desire on their part to oust the Gas Company; but they offered, as an experiment, to put up a 100-candle power light in any position the Council chose, and maintain it for a fortnight. The Chairman (Mr. Parnell) said the Gas Company charged £3 per annum, the Electric Light Company offered to do the lighting for £2 10s.; and the suggestion of the Committee was that they should try only three lamps as an experiment. The recommendation of the Committee was approved.


SAWER & PURVES,

THE PIONEERS OF THE SLOT METER.

FIRST IN 1889.

THE INTRODUCTION OF THE SLOT METER.

WRITING to supplement the information given in our "Questions and Answers" column last week with regard to the introduction of the slot meter, a correspondent says that the first patentee was Mr. W. Brownhill, but his meter was never in practical use. The first Gas Company to supply gas in quantity through slot meters was the Liverpool United Gas Company. They supplied gas in bulk to the Corporation for the artisans' dwellings in Casino Street, Liverpool. The Corporation fixed 50 penny-in-the-slot meters in these dwellings. The meters were Thorp and Marsh's patent, and they were manufactured by Messrs. Sawer and Purves. The meters were fixed for six months on approval, at the end of which time the Corporation had to decide whether they were a success or failure. Mr. Marsh entered into a guarantee that the meters should be satisfactory, and he undertook liability for any accident that might occur. Our correspondent adds that he has no hesitation in saying that Sir George Livesey was the first man controlling a gas undertaking to strenuously advocate the use of the slot meter.

GAS v. ELECTRICITY

(From the GAS WORLD.)

FOREMOST 1909.

*Scotch Agent:* JNO. D. GIBSON, 93, Hope Street,

MILES PLATTING, RADFORD ROAD,

MANCHESTER, GLASGOW, NOTTINGHAM.

**National Lighting Corporation, Limited.**—This is the title of a Company registered on the 30th ult., with a capital of £1000 in £1 shares.

**Fatality at the Lausanne Gas-Works.**—It is rather curious that, following our account last week of the deplorable accident at the Geneva Gas-Works, we should have to record a fatality at the works supplying the neighbouring town of Lausanne. It occurred the day after the Geneva explosion. A workman was cleaning the top of the superheater of the water-gas plant, and had left his mate only ten minutes when he was found dead. Artificial respiration was tried; but, unhappily, it was unsuccessful. The plant was not in operation, but was heated up for working next day. Suffocation must have resulted from the inhalation of the carbon monoxide gas from the generator.

**Sales of Shares.**—At the Public Hall, Wisbech, a few days ago, Mr. Joseph Johnson offered for sale some ordinary £10 shares (6 per cent.) and some original shares (9 per cent.) of the same nominal value in the Wisbech Water Company. The price realized for the former was £14 10s. each, and for the latter £19 15s. apiece. An important sale of £3000 of new ordinary consolidated 5 per cent. stock of the Basingstoke Gas Company was recently conducted by Mr. A. W. Tyrrell. It was offered in lots of £100, £50, £20, and £10; and the premiums realized on each class were 8 to 11½, 6 to 8, 5 to 7½, and 5 per cent. respectively—the average price obtained being £108½ per £100 of stock.

**Dartmouth Water-Works Extension.**—An inquiry was held at Dartmouth last Wednesday, by Mr. F. H. Tulloch, on behalf of the Local Government Board, respecting an application by the Town Council for power to borrow £1000 for the water-works. It was explained that the Council borrowed £6000 for the improvement of the water supply recently carried out; but additional expense had been incurred which it was necessary to meet. The Town Clerk (Mr. S. J. Pope) and the Borough Surveyor (Mr. T. Joyce) explained how the extra expenditure was incurred; the chief portion being in connection with the construction of a reservoir, the ground presenting some difficulties, and rendering it necessary to use more concrete than was originally intended.

**Coal Tar for Roofs.**—In answer to the inquiry by a correspondent the "Ironmonger" on the above subject, to which reference was made in the "JOURNAL" last week (p. 594), Messrs. Brownlie and Murray, Limited, of Fenchurch Street, E.C., have written to our contemporary that after a long experience in the painting of galvanized and corrugated sheets for roofing, they have arrived at the conclusion that the reason why the matter indicated is of no use for the purpose is that it blisters under the heat of the sun. Afterwards the blisters break, and rain and moisture get into the recess and eat away the sheets. Messrs. Samuel Courtney, Limited, of Dalton Street, Belfast, have written as follows: "Coal tar is not a suitable coating for galvanized iron roofs, as it contains organic acids which rapidly attack the metal. The best coating is a good quality of bitumen solution made from natural bitumen freed from all acids."

**Rochdale Corporation Water Undertaking.**—At a meeting of the Rochdale Town Council last Thursday, Mr. Sharp asked if it was a fact that the water undertaking of the Corporation had cost £720,960, and was not paying. The Chairman of the Water Committee (Alderman W. T. Heap), in reply, said the cost of the works exceeded the amount named. The undertaking was not paying; and between £2000 and £3000 more than last year would be required for the renewal of pipes.

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Messrs. Willey and Co., Limited, have sent us their new catalogue of gas-fittings, &c., which contains a very fine collection of brackets for both upright and inverted burners, pendants, church fittings, mantles, meters, &c. The goods shown occupy about 150 large quarto pages; and they are very artistically and effectively presented. The catalogue is bound in cloth, gilt lettered.

Last Wednesday, one of the city water-mains burst at the top of Hill Street, Birmingham. Traffic along the thoroughfare was stopped; and in response to a message, the Water Department dispatched a staff of men to the spot. The water was turned off, and remedial measures taken, though not without some difficulty, owing to the fact that the junction of the mains occurs at this point.

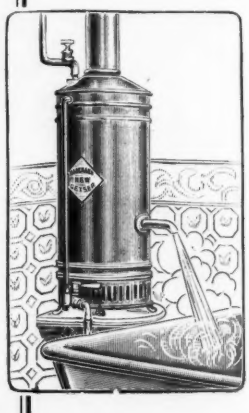
By 53 votes to 18, the Manchester City Council last Wednesday adopted a resolution for the appointment of a Special Committee to report on the desirability of fixing the hours of labour for all Corporation employees at eight hours per day, or 48 hours per week. Mr. Johnston, who moved the resolution, said that the eight-hour system was working smoothly in the Gas and Electricity Departments, though the hours worked there might exceed 48 per week.

We have received the season's supplementary list (1909) of the Pneumatic Gas Lighting Company, Limited, which contains several new fittings and accessories. Among other things may be mentioned a pear-shaped hanging push, suspended on a flexible tube or cord, a curved bye-pass fitted with a draught protection shield, a third sized tubing in 96-inch lengths for very long distance lighting, and connection rings to slip over down-stems, &c. The list includes a useful set of instructions for fixing the apparatus.

We have received from Mr. W. Briggs, of 5, Lambeth Hill, Queen Victoria Street, E.C.—who read a paper before the London and Southern District Junior Gas Association last autumn, on "Heating Water by Gas"—a useful collection of working notes for gas inspectors, foremen, and fitters, presented in a neat booklet bearing the title of "Tatsal Tips." The notes have been compiled by Mr. F. C. Briggs in great measure from actual working tests. They embody an experience extending over 35 years; and their purpose is to answer many of the questions which daily confront the engineer and fitter. As one of these frequently bears upon the relative cost of gas and electricity, the page devoted to this subject will be found very convenient for reference; as will those containing hints on hot-water circulation and the generation of steam. Mr. Briggs will be pleased to supply copies of his little book on application being made to him.


MAUGHAN

Stimulate Business.
Increase Gas Consumption.
Solve the Hot Bath Problem.
Are Safe, Simple, and Popular.
Enjoy Public Confidence.
Are the Original Make.
Are Hired Out by many Gas Undertakings.



GEYSERS

BIRMINGHAM: Stour Street.

THE PARKINSON STOVE CO., LTD.,
(Incorporating Maughan's Patent Geyser Co.)

LONDON Office and Show-Room: 129, High Holborn, W.C.

The Davis Gas Stove Company, Limited, have declared an interim dividend on the ordinary shares at the rate of 5 per cent. per annum for the six months ending the 30th of June.

Messrs. Silcock and Tongue, of Aston, Birmingham, make a speciality of outside lamps for street, hotel, and window lighting, and also for advertising purposes; and they have just issued a new priced catalogue (No. 16) in a more compact form than hitherto. Gas and oil lamps are shown in the greatest possible variety; and there is a good collection of brackets, standards, and arches. All the lamps are made on the firm's premises, under their personal supervision.

The Carron Company have just executed an important order for fire-grates for the Ameer of Afghanistan's new palace in course of erection at Cabul. These fire-grates, 22 in number, are fitted with dogs to harmonize, and have heavy canopies of different kinds. The designs, which have been approved by the Ameer, are essentially Oriental in style, presenting a striking and handsome appearance; while on the brass-work, of which the grates are almost wholly composed, much hand labour has been expended. A special feature of these grates is the unusually large fire space, on the assumption that wood will be burned as fuel. The grates are beautiful examples of the ironfounder's art.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

**Situations Vacant.**

ACCOUNTANT, &c. Merthyr Tydfil Gas Company.
MAINTENANCE ATTENDANT. H. C. Borradaile, Grays.
REPRESENTATIVE. No. 5131.
WORKING FOREMAN. No. 5128.

**Agency Required.**

B. G., c/o DAVIES AND CO., Cornhill.

**Gas Mantle Manufacturers.**

REPRESENTATIVES WANTED BY. No. 5129.

**Partnership.**

METER AND GOVERNOR BUSINESS. No. 5132.

**TENDERS FOR**

**Coke.**

RAMSGATE CORPORATION. Tenders by Sept. 13.
WANDSWORTH AND PUTNEY GASLIGHT COMPANY. Tenders by Sept. 17.

**Purifiers, &c.**

CHELTENHAM GASLIGHT COMPANY. Tenders by Sept. 22.

**Sulphuric Acid.**

HEYWOOD CORPORATION. Tenders by Sept. 14.

**Tubes and Fittings and Tinned Goods.**

HEYWOOD CORPORATION. Tenders by Sept. 14.

## NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

*No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.*

**COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.**

**Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.**

**Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.**

**TERMS OF SUBSCRIPTION to the "JOURNAL."**
**United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.**
Payable in advance. If credit is taken, the charge is 25s. a year.
**Abroad (in the Postal Union): £1 7s. 6d., payable in advance.**

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
**Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.**


**OXIDE OF IRON.**

**O'NEILL'S OXIDE**
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE.

**SPENT OXIDE PURCHASED IN ANY DISTRICT.**

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

**WINKELMANN'S**
**"VOLCANIC" FIRE CEMENT.**
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

APPLY TO THE
**CHAIN BELT ENGINEERING CO.**
DERBY, ENGLAND,
FOR REALLY HIGH-CLASS
**ELEVATORS AND CONVEYORS**
ALSO
**DRIVING AND CONVEYOR CHAINS.**

**GEO. NEWTON, Limited,**
Wires: "AUTOMATIC, MANCHESTER."
40 YEARS' REPUTATION.
WET, DRY, ORDINARY and PREPAYMENT, STATION METERS, &c.
Late of Oldham—Note *new* Address:—
**39, RIVER STREET, HULME, MANCHESTER.**

**AMMONIA.**
Consumers in any form are invited to correspond with CHANCE AND HUNT, LTD., Chemical Manufacturers, OLDBURY, WORCS.

**J. & J. BRADDOCK (Branch of Meters Limited),** Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 815 Oldham, and 2412 Hop, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

**OXIDE OF IRON (BOG ORE)**
ANY QUANTITY. ANY PORT. ANY STATION.
**DONALD M'INTOSH,**
110, CANNON STREET, LONDON.

**BENZOL**
AND
**CARBURINE FOR GAS ENRICHING.**
ALSO
**THE MAXIM PATENT CARBURETTOR.**
For Prices, &c., apply to
THE GAS LIGHTING IMPROVEMENT CO., LTD.,
7, BISHOPSGATE STREET WITHOUT,
LONDON, E.C.
Telegraphic Address: "Carburine, London."

**LUX'S GAS PURIFYING MASS.**
See Advertisement on p. 657.
FRIEDRICH LUX, LUDWIGSHAFEN-AM-RHEIN.

**METER INDICES WITH AND WITHOUT DIALS.**
**A. ROUX & CO., Limited,**
9, SOUTHAMPTON STREET, HOLBORN, W.C.
MOVEMENTS FOR CLOCKS, PHOTOMETERS AND BAROGRAPHS, WHEELS, PINIONS, AND WORMS.
WORKS, HANDSWORTH, BIRMINGHAM.

**BROTHERTON & CO., LIMITED.**
Offices: City Chambers, LEEDS.
Correspondence invited.

**OXIDE OF IRON.**
(NATURAL.)
SPENT OXIDE PURCHASED.
**BALE'S FIRE CEMENT.**
**PAINT FOR GAS-WORKS.**
**BALE & CHURCH,**
5, CROOKED LANE, LONDON, E.C.

**SULPHURIC ACID.**
**SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.**
**SPENCER CHAPMAN & MESSEL, LTD.,**
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

**R. & G. HISLOP,**
GAS ENGINEERS, RETORT BUILDERS, CONTRACTORS, &c.
RETORT SETTINGS, COAL-TESTING PLANT, BOILER FIRING.
UNDERWOOD HOUSE, PAISLEY.

**SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.**
BROTHERTON AND CO., LTD., Chemical Manufacturers, Works: BIRMINGHAM, LEEDS, WAKEFIELD, and SUNDERLAND.

**ROBERT B. FITZMAURICE,**
4, EAST INDIA AVENUE,
LEADENHALL STREET, LONDON.
Telegraphic Address: "FITZMAURICE, LONDON." Telephone: No. 11,113 CENTRAL.
Established 1887.
Advertiser, who is Shipping Agent to several Gas Companies, Municipalities, and Gas Material Makers, would be glad to undertake SHIPMENT OF GOODS ordered by Colonial Gas-Works or Others.

**ROBERT DEMPSTER & SONS, Ltd.,**
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

**KRAMERS AND AARTS WATER-GAS PLANT.**
K. & A. WATER-GAS COMPANY, LTD.
89, VICTORIA STREET, S.W.

**D. ANDERSON AND COMPANY,**
GAS LIGHTING ENGINEERS AND CONTRACTORS,
18 & 20, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "Dacolight London." Telephone: 2886 Holborn.

**AMMONIACAL Liquor wanted.**
Brotherton and Co., Ltd., Ammonia Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, Wakefield, and Sunderland.

**"GAZINE" (Registered in England and Abroad).** A radical Solvent and Preventative of Naphthalene Deposits, and for the Automatic Cleaning of Mains and Services.
It is also used for the enrichment of Gas.
Manufactured and supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agent, F. J. Nicol, Pilgrim House, Newcastle-on-Tyne.
Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

**TAR WANTED.**
National Telephone 7002. Telegrams: "UPRIGHT."
Apply, THOMAS HORROCKS
Albert Chemical Works, BRADFORD, MANCHESTER.
Pitch, Creosote, Brick and Fuel Oils, Benzol, Solvent Naphtha, Sulphate of Ammonia.

**HYDRATED OXIDE OF IRON.**
**PREPARED from Pure Iron.**
Twice as Rich as Bog Ore.
Gives no back Pressure.
The Cheapest in the Market.
Read Holliday and Sons, Ltd., Huddersfield.

**GAS TAR wanted,**
Brotherton and Co., Ltd., Tar Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, Wakefield, and Sunderland.

**AMMONIACAL Liquor wanted.**
Chance and Hunt, Ltd., Chemical Manufacturers, Oldbury, Worcs.
Telegrams: "Chemicals."

**DELLWIK-FLEISCHER WATER GAS.**
BLUE WATER GAS, CARBURETTED WATER GAS, SELF-CARBURETTING.
**FOR Particulars of Annual Generating** Capacity of Plants built or in course of construction, see Advertisement in the "Journal" for Aug. 24, p. 538.
The Dellwik-Fleischer Water Gas Syndicate, 25, Victoria Street, Westminster, London, S.W. Telegraphic Address "Dellwik, London."

**J. E. C. LORD, Ship Canal Tar Works,** Weaste, Manchester. Pitch, Creosote, Benzols, Toluol, Naphtha, Pyridine, all kinds of Cresylic Acid, Carbolic Acid, Sulphate of Ammonia, &c.

**"VITERNUS" METALLIC PAINT FOR GAS-WORKS PLANT.**
**JOHN E. WILLIAMS AND CO.,**
LOWER MOSS LANE,
MANCHESTER, S.W.
Telegrams: "Enamel." National Telephone 1759.

**FIDDES-ALDRIDGE**
**SIMULTANEOUS Discharging-Charger.**
The one Machine which Discharges and Charges at One Stroke.
See Advertisement, June 22, p. VI. of Centre.
ALDRIDGE AND RANKEN,
39, Victoria Street, Westminster, S.W.
Telegrams: "Motorpathy, London." Telephone: 5118 Westminster.

**TO Gas Managers, &c., Wanted, Old** Condemned GAS-METERS, from 1-light to 1000-light, for destruction to re-claim Metals. Write for Prices, Stating Quantities and Sizes, and if Wets or Drys. Scrap Metals, Drosses, Metal Shop Sweepings, &c., also bought.
J. Wilson, Pleasant Grove, York Road, King's Cross, London, N.

**BRISTOL RECORDING GAUGES AND THERMOMETERS.**
J. W. & C. J. PHILLIPS, 23, College Hill, London, E.C., and 25, Bridge End, Leeds.

**SULPHATE OF AMMONIA SATURATORS** and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
Joseph Taylor and Co., Central Plumbing Works, Bolton.
Telegrams: Saturators, Bolton. Telephone 0848.

**SULPHURIC ACID.**
**SPECIALLY prepared for Sulphate of** AMMONIA Makers by
CHANCE AND HUNT, LIMITED,
Works: Oldbury, Wednesbury, and Stafford.
Address Correspondence and Inquiries to Oldbury, Worcs.
Telegrams: "Chemicals, Oldbury."

**GAS PLANT for Sale—We can always** offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
Firth Blakeley, Sons, and Company, Limited, Thornhill, Dewsbury.

**PATENTS AND TRADE MARKS**
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 & 73, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

**APPLICATIONS for Appointments** arranged effectively. Greatly appreciated by Recipients. Numerous unsolicited Testimonials. Write Now for Particulars.
Herbert Greatorex, Birchover, Matlock.

**MR. WM. CRANFIELD, F.C.S., in re**sponse to requests, has decided to extend the work he has been carrying on by Gas Classes in various Yorkshire Towns for the past Ten Years, and to organize postal courses of Tuition in "Gas Engineering" and "Gas Supply." Close personal attention will be given to the needs of each individual Student, and Expert Assistance has been engaged. All Inquiries treated confidentially.
Full Particulars on Application to No. 11, Avondale Place, Halifax.

**CORRESPONDENCE CLASSES.**
**GAS Engineering and Gas Supply.**
City and Guilds of London Institute.
Teacher: HERBERT LEES (Silver Medallist), Assoc.M.Inst.C.E., Engineer and Manager of the Hexham Gas Company, Lecturer at Rutherford College, Newcastle-on-Tyne.
For Terms, &c., address Elvaston Road, Hexham.

**PARTNERSHIP.**
**A THOROUGH experienced and Com**petent man in every kind of Gas Meters, the designing of Station Meters and Governors, Retort-House Governors, Gauges of every Description, and other kinds of Gas Apparatus, and the very best methods for the Manufacture and Repair of same, to meet the keenest of Competition, is desirous of meeting a Gentleman with a view to commence in Business.
Address No. 5132, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

**REPRESENTATIVES, calling on Gas** Undertakings, Ironmongers, and Gas-Fitters, working on Commission only, wanted by Gas Mantle Manufacturers for London and South, West of England, and North Grounds.
Apply, by letter, with Particulars, to No. 5129, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

**WANTED, at once, a thoroughly Prac**tical and Competent Man as MAINTENANCE ATTENDANT. Must be acquainted with Modern Methods of Lighting and Heating. One with knowledge of High-Pressure Lighting preferred; also Cyclist. Wages, 30s. per Week.
Apply, stating Age, Experience, and with *copies* of Testimonials, to H. C. Borradaile, Bank Buildings, High Street, Grays.

**MERTHYR TYDFIL GAS COMPANY.**
**WANTED, a thoroughly experienced** GAS ACCOUNTANT, capable of carrying out the SECRETARIAL DUTIES and TAKING CHARGE of Office Staff.
Salary, £175 per Annum.
Applications, stating Age and Experience, with *copies* only of Three recent Testimonials, to the undersigned on or before Sept. 28 inst.
James E. Kenshole,
General Manager.
Gas Offices, Gas-Works,
Merthyr Tydfil, Sept. 4, 1909.

**HIGH Pressure Gas Lighting—A** REPRESENTATIVE required who must have up-to-date experience.
Apply, by letter, giving full Particulars, to No. 5131, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

**CONTINENTAL Factory of Incan**descent Gaslight Mantles, capable of turning out large quantities, and which has been Successful, in Competition with other Firms, in obtaining Extensive Contracts from large Towns, &c., is desirous of getting into Communication with a Competent Firm, well introduced to the Lighting Branch of the Trade, regarding AGENCY of their Specialities.
Address by letter "B.G." care of Davies and Co., Advertising Agents, Finch Lane, Cornhill.

**WANTED, an experienced Working** FOREMAN for a Gas-Works near London making about 55 Millions.
Must be a good Carburizer, with a knowledge of Carburetted Water Gas Manufacture and Sulphate Making, and the usual Works Machinery. Age 30 to 40 years. Wages 30s. per week, with Cottage, Coal, and Gas Free.
Apply, by letter, to No. 5128, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

**GASHOLDERS—Splendid, 45 feet dia**meter, and New STEEL TANK fixed complete, to Plan and Specification. Also 50 feet Single-Lift and 50 feet Double-Lift. Cheap, with STEEL TANKS. Can be seen temporarily erected.
Firth Blakeley's, Thornhill, Dewsbury.

**PURIFIERS—Set of Four, 12 feet** Square, fixed complete. A bargain. Also Four 6 feet Square, Two 8 feet, Four 8 feet, and Two 12 feet square PURIFIERS. Cheap.
Firth Blakeley's, Thornhill, Dewsbury.

**BOROUGH OF HEYWOOD.**
**THE Gas Committee invite Tenders for** the Supply of TUBES and FITTINGS, SULPHURIC ACID, and TINNED GOODS.
Specification and Form of Tender may be obtained upon Application to Mr. W. Whatmough, Gas Manager.
Sealed and endorsed Tenders to be sent to me not later than Tuesday, Sept. 14, 1909.
By order,
Geo. G. Bouchier,
Town Clerk.
Municipal Buildings, Heywood,
Aug. 18, 1909.

**CHELTENHAM GASLIGHT AND COKE COMPANY.**
PURIFIERS, &c.
**THE Directors invite Tenders for the** Supply and Erection of a set of Six Cast-Iron PURIFIERS, 40 ft. by 30 ft. by 6 ft., together with Valves, Connections, Oxide Elevators, &c.
Copies of the Specification and Drawings can be obtained on and after Wednesday, the 1st day of September next, on Payment of One Guinea.
Tenders, addressed to the undersigned, to be delivered on or before Wednesday, the 22nd day of September next.
The Directors do not bind themselves to accept the lowest or any Tender.
R. O. Paterson,
Engineer and Manager.
Gas-Works, Cheltenham,
Aug. 25, 1909.

**COKE.**
**THE Directors of the Wandsworth and** Putney Gaslight and Coke Company invite TENDERS for the Removal of about 10,000 Tons of Guaranteed "WANDSWORTH" COKE from their Works at Wandsworth between Oct. 1 next and March 31, 1910.
The Coke to be removed by Van or by Barge (free waterway on River Thames).
Sealed Tenders, endorsed "Tender for Coke," to be delivered not later than the 17th of September.
The Directors reserve to themselves the right to accept any Tender in part or in whole, and do not bind themselves to accept the highest or any Tender.
Any further Information may be obtained from the Engineer, Mr. H. O. Carr.
Chas. W. Braine,
Secretary.
Wandsworth and Putney Gaslight and Coke Company,
Fairfield Street, Wandsworth, S.W.
Aug. 25, 1909.

**RAMSGATE CORPORATION.**
(Gas and Water Department.)
**THE Committee invite Tenders for the** Purchase of the whole of their Surplus COKE (estimated at from 1500 to 2500 Tons), or for Quantities of not less than 200 Tons per Annum, from the 1st of October, 1909, to the 30th of September, 1910, delivered free on Rail or Barge, Ramsgate, or free into Carts at the Gas-Works, Ramsgate. Purchaser in any case to pay dues.
Further Particulars, together with Conditions and Form of Tender, may be obtained from the undersigned.
Tenders to be sent in not later than Noon on Monday, Sept. 13, 1909, addressed to the Chairman of the Gas and Water Committee, Boundary Road, Ramsgate, endorsed "Tender for Coke."
The Committee do not bind themselves to accept the highest or any Tender.
Wm. Thomson,
Engineer and Manager.
Gas and Water Offices,
Boundary Road, Ramsgate,
August, 1909.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MESSRS. A. & W. RICHARDS beg to notify that their SALES BY AUCTION of NEW CAPITAL ISSUED UNDER PARLIAMENTARY POWERS, and of STOCKS and SHARES belonging to EXECUTORS and other PRIVATE OWNERS in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES, take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing New Capital, and also for including other Gas and Water Stocks and Shares in these Periodical Sales, will be forwarded on Application to MESSRS. A. & W. RICHARDS, at 18, FINSBURY CIRCUS, E.C.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

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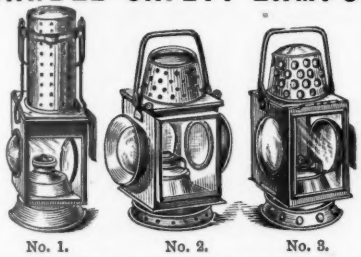
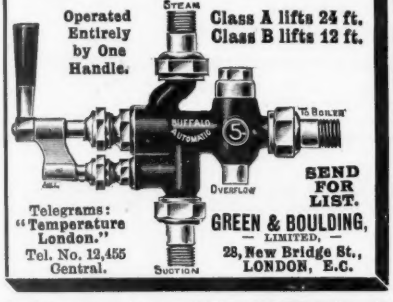
CANDLE SAFETY LAMPS.



No. 1. No. 2. No. 3.

43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

'BUFFALO' INJECTOR

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Class A lifts 24 ft.
Class B lifts 12 ft.

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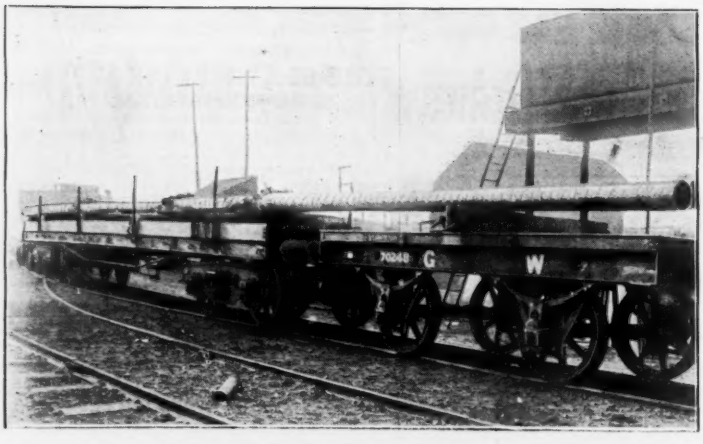

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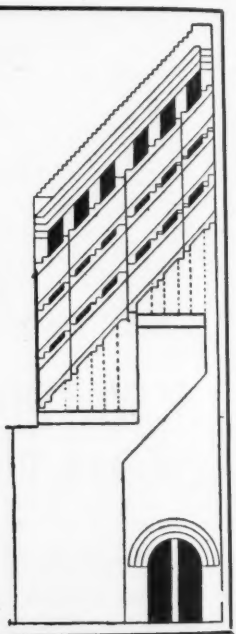

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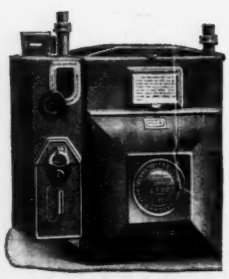

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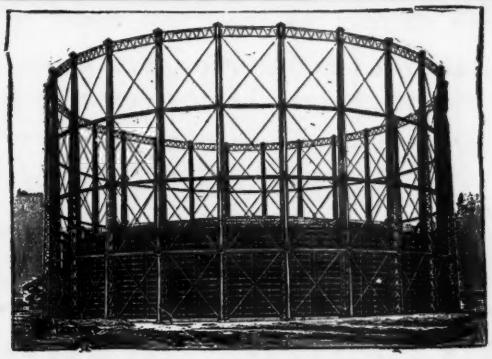

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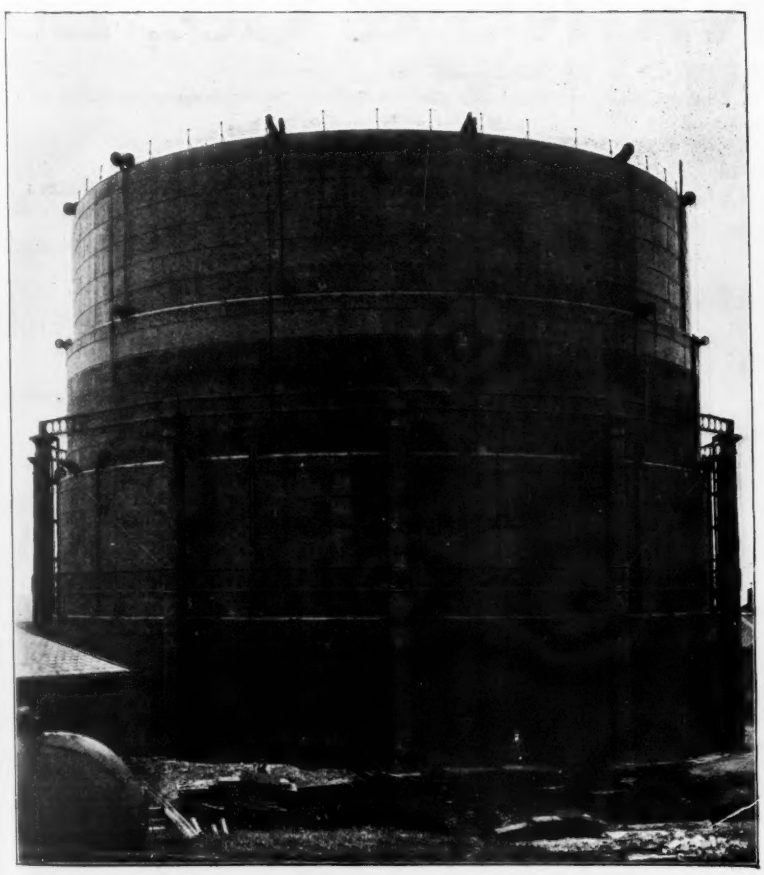

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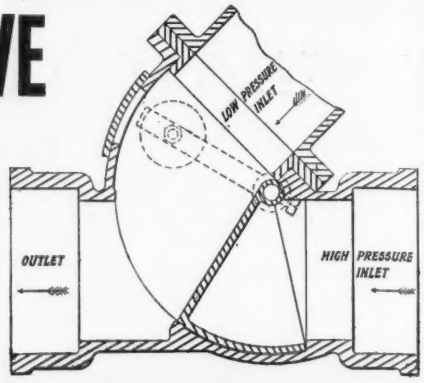


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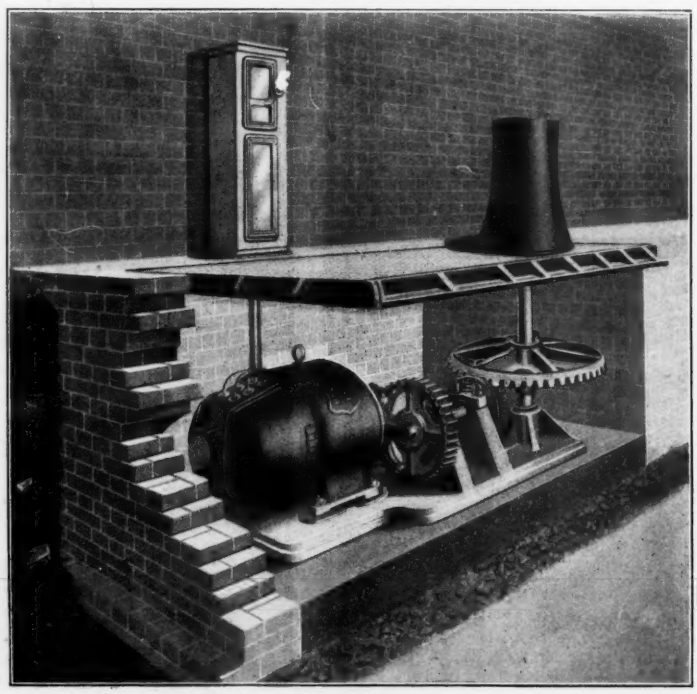

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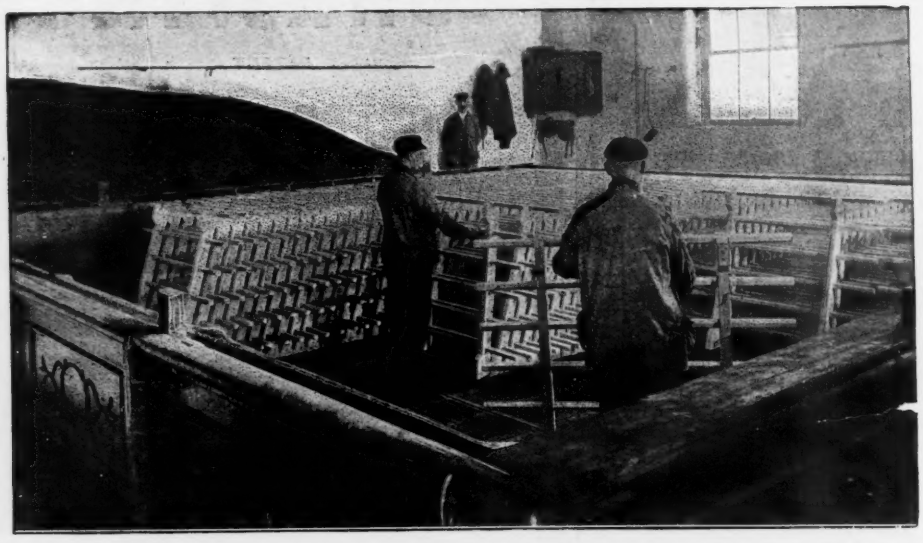

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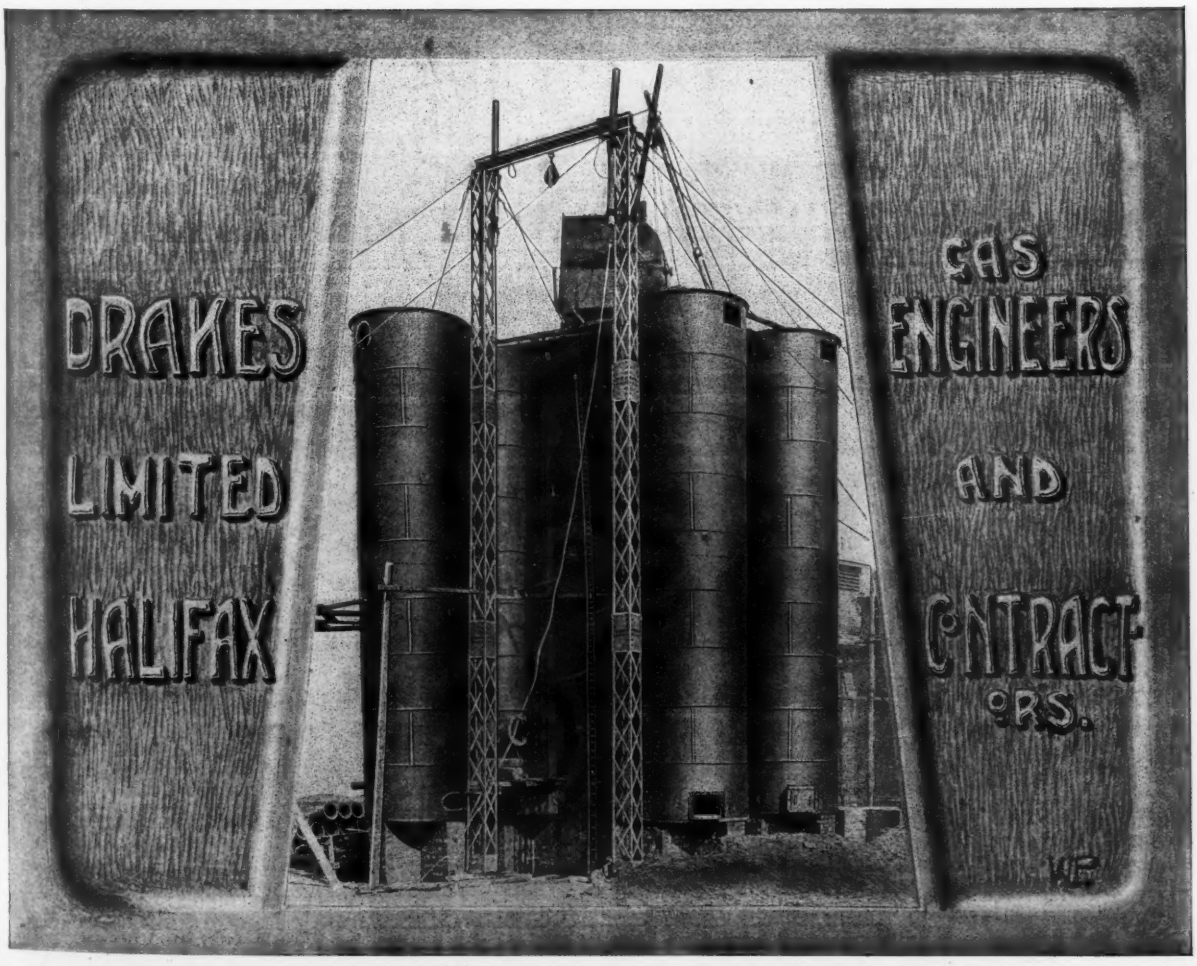

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**COKE** (Dry) produced per ton of Coal, **14·2** cwt.

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**TAR,** free from Liquor,
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**AMMONIACAL LIQUOR,**
**31·7** gallons 10 oz. per ton.

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